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CHINA REPORT

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APPLIED SCIENCES

CHINESE ACADEMY OF SCIENCES HOLDS EXHIBITION OF LASERS, SPECTROSCOPIC INSTRUMENTS

Shanghai JIGUANG [LASER JOURNAL] in Chinese Vol 8 No 10, Oct 81 pp 44-48

[Article by Ji He [0679 4421]]

[Text] Abstract. The exhibition of lasers and spectroscopic instruments held by the Department of Technical Sciences, Chinese Academy of Sciences in Beijing is reported, and selected exhibits described.

The institutes of the Chinese Academy of Sciences have made considerable progress in the last 2 years in laser and spectroscopic instrument development standards and production capacity. In order to make new products widely available, during the fourth meeting of the CAS academic committee, the Department of Technical Sciences held a report meeting and exhibition in Beijing at which 32 products, including medium and low power laser devices, spectroscopic instruments and optical measuring instruments, were displayed (see table).

A striking feature of this exhibition was that with the exception of some special exhibits, most of the products were finalized designs, and some were already in small-scale trial production. Not only were the products attractively designed, with standard instrument packaging, but they had relatively stable characteristics. In addition, some of the products were of modular design, making purchase by the users easier.

Because of space limitations, below we limit ourselves to brief descriptions of several laser devices.

The HLJ-1000 1000-Watt Transverse-Flow CO_2 Laser

Produced by the Shanghai Institute of Optics and Precision Mechanics, this is a closed-cycle gas laser with a continuous output power of 1,000 W. It uses CO_2, N_2 and He as the working gases, and rapid flow is used to achieve fast cooling of the working gas.

Working gas pressure	~65 Torr
Power stability	±5 percent (1 hour)
Laser conversion efficiency	> 15 percent
Preionizing discharge current	50 mA
Gas flow speed	15 m/sec

This laser is a new product for lasermachining which is suited for cutting and welding of special materials and for surface machining and anticorrosion treatment of metals.

The JDY-80A YAG Laser Monochromator

Produced by the Shanghai Institute of Optics and Precision Mechanics, this device produces extremely bright coherent monochromatic polarized light in the visible range, and when used with a frequency doubler or frequency adder it can be extended to the near ultraviolet region.

The monochromator consists of a dye laser and a YAG-laser pumping unit. The dye laser uses prism tuning and is equipped with eight dye cells, allowing rapid change of dyes. Adjustment of the completely reflective mirror allows continuous change of laser wavelength. Four of the dyes are used for near-longitudinal pumping with an 0.532 micron laser beam, while the other four use transverse pumping with an 0.355 micron laser beam. The YAG laser consists of an oscillator stage and an amplifier stage and is provided with frequency doublers and adders which can produce second, third and fourth harmonics. The peak laser output power at all wavelengths exceeds 1 MW, and the four wavelengths all have important applications.

Tuning range	4200-6800 Å
Peak power	1 MW (Rhodamine 6G)
Spectral width	1-2 Å (Rhodamine 6G)
Repetition frequency	1-5 sec^{-1}
Pulse width	10 ns

This device can operate continuously for several hours and has a cumulative life of more than 3,000 hours (changing of neon lamps required).

The GFS-1 High-Reflectivity Measuring Instrument

Developed by the Shanghai Institute of Optics and Precision Mechanics, this is a precision measuring instrument used primarily for precise measurements on high-reflectivity laser mirrors. The measurement range includes the visible and near infrared regions. The device can be used for precise determination of the spectral transmissivity of optical components, and accordingly it can also function as an ordinary spectrophotometer. In addition it can be used for measuring the uniformity of mirror reflectivity.

The device uses the double reflection principle and makes absolute measurements.

Measurement range	4000-11000 Å
Measurement precision	
4000-7500 Å	$\leq \pm 5 \cdot 10^{-4}$ percent
7500-11000 Å	$\leq 1 \cdot 10^{-3}$ percent
Types of measurement	
Reflectivity of near perpendicular (≈4°) incident light	
Reflectivity of light incident at 45°	
Uniformity of mirror surface reflectivity	
Transmissivity	
Dimensions of testable items (mm)	ϕ20-50 [mm] diameter flat, high-reflectivity plane mirrors or other optical components

A Monochromatic Continuously-Tunable Ring Dye Laser

Developed by the Changchun Institute of Optics and Precision Mechanics, this continuously tunable dye laser uses a ring cavity in which is inserted a Farady-effect direction selection, producing a single-direction traveling wave and eliminating "spatial hole burning." This device has the following advantages over a stationary-wave linear (three-mirror folded cavity) dye laser: a single frequency can be obtained by using a low-precision frequency-selective etalon; it has high energy conversion efficiency; and it can accept a high pumping power and produce a high-power single-frequency laser output.

When a 4-W argon ion laser is used for full-spectrum pumping and Rhodamine 6G dye (3×10^{-3} molar ethylene glycol solution) is used as the active medium, in the vicinity of the dye's peak wavelength the output of the ring cavity exceeds 800 mW, equivalent to an efficiency of 20 percent. When the Faraday element, a birefringent filter plate and the etalon are inserted in the cavity, a one-directional single-wavelength output above 450 mW is obtained. Measured with a spherical confocal scanning interferometer, the single-frequency linewidth is less than 50 MHz (equivalent to $\Delta\lambda = 6 \cdot 10^{-4}$ Å). When a single-plate birefringent filter is used, continuous coarse wavelength tuning is possible between 5700 and 6300 Å. When a phase-locked loop circuit, cavity-length adjustment and a piezoelectric scanning air-gap etalon are used for precise wavelength tuning, the scanning range is 30 GHz.

The DAJ-3 and DAJ-5 Argon Ion Lasers

Developed by the Institute of Electronics, these devices are of stable quality and are already in small-lot production.

Model	DAJ-5	DAJ-3
Nominal output power (multiline)	5 W	3 W
Maximum output power (multiline)	8-9 W	4-4.5 W
Beam diameter	2 mm	2 mm
*Beam divergence	2 mrad	2 mrad
Operating life	1,000 hours or guarantee of 1 year	
Polarization state	Linear polarization, polarization plane horizontal, degree of polarization above 100:1	
Steady current control	±3 percent	
Optoelectronic negative feedback control	±1 percent	

The JVG Laser Microspectrometer

Developed by the Anhui Institute of Optics and Precision Mechanics. This device consists primarily of a laser microprobe, a 1-meter flat grating spectrograph and a power supply control unit. The lasermicroprobe consists of a ruby laser with choice of static or Q-switched output, a variable spatial wave filter assembly and three focusing objectives of different focal lengths, and can produce melting cavities with diameters from 10 to 500 microns in the sample. The observation focal system is equivalent to a microscope with powers of 60X, 150X and 600X and the maximum resolution is equivalent to 0.001-0.002 [?mm]; it also allows photomicrography and polarized-light observation of the sample surface.

Analyzer sensitivity	
absolute sensitivity	10^{-10} - 10^{-12} g
relative sensitivity	10^{-2} - 10^{-3} percent
Stability of laser output power	$\leqslant 5$ percent

A Long-Life (AlGa)As/GaAs Double Heterostructure Laser

Developed by the Institute of Semiconductors, this laser uses the proton-bombarded strip structure, and all of its transistors were aging tested for 200 hours at room temperature, assuring long life. Some components have lasted more than 20,000 hours in continuous operation at room temperature; the average life at room temperature inferred from high-temperature aging experiments is 80,000 hours. The efficiency of coupling with optical fibers is generally up to 80 percent, with a maximum laboratory figure of 92 percent; a feedback device is provided, making it possible to control the laser output stability.

The exhibition opened on 15 May 1981. It was visited by more than 7,000 persons, including responsible comrades from relevant ministry committees under the Central Committee, members of the academic committee who were in Beijing for the academic committee meeting, and people in the field from research institutes and advanced schools in the Beijing area. Specialists from the Institute of Physics, the Dalian Institute of Physics, the Institute of Dynamics, the China Research Institute of Metrology, the Beijing Institute of Optoelectronics and other organizations were invited to form evaluation groups; these groups made conscientious evaluations of the products on exhibit.

Vice Premier Fang Yi, executive chairmen of the CAS Presidium Yan Jici [0917 3444 1964] and Li Chang [2621 2490], Vice Chairman of the State Committee on Science and Technology Wu Heng [2976 5899], Director of the Chinese Academy of Sciences Lu Jiaxi [4151 0857 6932], CAS Deputy Directors Hu Keshi [5170 0344 1395] and Yan Dongsheng [0917 2639 3932], General Secretary Yu Wen [6735 2429], and other leaders visited the exhibition and gave high praise to the achievement of our country's laser technology, while expressing ardent expectations for the future.

The exhibition closed on 30 May.

Products and Developers

Developer Unit	Product
Shanghai Institute of Optics and Precision Mechanics	HLJ-1000 1000-watt transverse-flow CO_2 laser
	TEACO_2-1 laser
	BDJ-Y2 CO_2 waveguide surgical laser
	XZJ-1 sealed room temperature tunable CO branch-selection laser
	SRJ-II flashlamp-pumped dye laser
	SMJ-2 mode-locked laser
	BPJ-1 YAG frequency-doubling laser
	JDY-80A YAG laser monochromator
	SSJ semiconductor laser
	JQY-300 laser holographic interferometer
	PG15-J4 flat plate laser interferometer
	GFS-1 high reflectivity measuring instrument
	Fabry-Perot etalon
	Laser components
Changchun Institute of Optics and Precision Mechanics	Single-frequency continuous-wave tunable ring dye laser
	Argon ion laser
	Fabry-Perot scanning interferometer
	CO_2 laser spectrum analyzer
	CO laser spectrum analyzer
	GDS50-1 digital grating-type dual monochromator
	GS-1 optoacoustic spectrometer
	GPM-1 optical-grating prism-type double monochromator
	TM-3000A1 solar simulator
	Diffraction gratings
Anhui Institute of Optics and Precision Mechanics	JVG laser microspectrometer
	YAG mode-locked laser
Institute of Electronics	DAJ-3 argon ion laser
	DAJ-5 argon ion laser
	Ultraviolet preionization high-pressure continuously tunable CO_2 laser
	250-watt large CO_2 laser surgical instrument
	Laser components
Institute of Semiconductors	Gallium-aluminum-arsenic double heterostructure laser

8480
CSO: 4008/59

CHINA CLAIMS SUCCESSFUL SPACE EXPERIMENT WITH ELECTROMAGNETIC PROPULSION

Beijing GUANGMING RIBAO in Chinese 14 Jan 82 p 1

[Text] A Chinese-developed electromagnetic rocket recently made its first experimental space flight.

The Electromagnetic Propulsion Laboratory of the Space Science and Technology Center of the Chinese Academy of Sciences has developed two impulse-plasma propulsion units which, with the cooperation of concerned parties, have successfully made their first experimental space flight. The success of this experimental flight demonstrates that China's electromagnetic research has reached a new plateau, giving us a new kind of mini-thruster.

Characterized by low thrust, high specific impulse, long operating life, quick response and high mobility, the electromagnetic rocket is well suited to handle attitude control and orbit corrections for both space shuttles and satellites.

Today, several nations are conducting research on a variety of electromagnetic rockets, with impulse-plasma propulsion being among those considered. The United States and the USSR began to experiment with this kind of propulsion in the 1960's, gradually putting it into use in space. Japan also pursued research in this area and conducted some experimentation in space. China is the fourth nation to experiment with electromagnetic rockets in space. The purpose of this experiment was to verify the overall performance of an electromagnetic rocket system in an actual space environment, confirming the results of testing on the ground, determining the effect of the electromagnetic rocket on the other systems so that the next steps in the research and application of this new technology can be taken. In this experimental flight, the telemetry results showed that the two propulsion units functioned normally and the entire experiment achieved the planned goals.

CSO: 4008/83

APPLIED SCIENCES

ZHANG AIPING ADDRESSES ISOTOPE CONFERENCE

OW050808 Beijing XINHUA in English 0742 GMT 5 Feb 82

[Text] Beijing, 5 February (XINHUA)--China's atomic energy development has reached a new stage and her atomic energy industry should from now on do its utmost to serve the national economy and the people's life.

Vice-Premier Zhang Aiping, who is also chairman of the Science and Technology Commission for national defense of the Chinese People's Liberation Army, made this statement at the ongoing national isotope conference that opened yesterday.

While continuing to fulfill a task for national defense, Vice-Premier Zhang Aiping added, the emphasis of atomic energy research, production and application in the future will be diverted for the promotion of peaceful utilization.

The work for the peaceful utilization of atomic energy should be first of all done in an organized, planned way, he said. Unified planning should be done jointly by the state Scientific and Technological Commission, the China Association for Science and Technology and the second ministry of machine building, and both production and application should be under the state planning and economic commissions.

On the progress of China's atomic energy program, Zhang Aiping said that it was initiated through self-reliant efforts during the years shortly after the founding of the people's republic "to break nuclear monopoly and blackmail by superpowers." He said that the industry now has a fairly comprehensive setup with a reliable base.

Professor Wang Ganchang, vice-minister of the second ministry of machine building, noted in his opening speech that China has a qualified base for large expansion of isotope technology, which will play an increasingly important role in the national economy.

The current national isotope conference is convened jointly by the state Scientific and Technology Commission, the P.L.A. Science and Technology Commission for national defense, the China Association for Science and Technology and the second ministry of machine building.

CSO: 4008/94

APPLIED SCIENCES

DEVELOPMENT OF GRAPHITE COMPOSITE MATERIALS DESCRIBED

Beijing GUOJI HANGKONG [INTERNATIONAL AVIATION] in Chinese No 8, 5 Aug 81 pp 39-42

[Article by Zhao Qusen [6392 3255 2773]: "Development of Graphite Composite Materials"]

[Text] We began developing graphite fiber reinforced blades for aircraft engines in 1969, and this was followed by the development of studies in composite materials used for aircraft components. The first non-load-bearing graphite fiber reinforced cap was installed for flight testing in 1975. Later, we developed some structural components including plates for the outer wall of the aircraft intake duct. The outer wall plates were installed for flight testing in 1978, and on this basis we will develop components that can withstand even greater force.

In the development of composite materials, our guidelines were to develop graphite fibers first in choosing between boron fibers and graphite fibers, and to develop resin bases first in choosing between resin bases and metallic bases. We were enthusiastic but careful in the method of development. We emphasized the fundamentals and paid attention to engineering problems in application. This article is a brief introduction to applied research in composite materials for aircraft and engines.

Basic Research

Fiber reinforced composite materials are multiphase nonuniform anisotropic materials. They possess many characteristics different from isotropic materials (such as metals). These characteristics will be reflected in various aspects such as structural design, forming techniques, and performance tests. Therefore, basic research must be emphasized. From the engineering viewpoint, basic research generally includes the following:

1. Research on Basic Characteristics of Materials

Four engineering constants and five kinds of strength data are required to express the rigidity and strength of composite materials. These engineering figures are the basic parameters for calculating rigidity and strength inside laminated plates. These are also indispensable data for lamination design. The nine figures for domestically produced unidirectional graphite composite materials are:

1) The modulus of elasticity along the direction of the fiber E = 9,800 kilograms/centimeter^2

2) Modulus of elasticity in a direction perpendicular to the direction of the fiber E = 860 kilograms/centimeter^2

3) Poisson ration ν = 0.31

4) Shear elasticity G = 415 kilograms/centimeter^2

5) Shear strength τ = 645 kilograms/centimeter^2

6) Tensile strength along the direction of the fiber σ = 10,670 kilograms/centimeter^2

7) Tensile strength perpendicular to the direction of the fiber σ = 360 kilograms/centimeter^2

8) Compressive strength along the direction of the fiber σ = 8,550 kilograms/centimeter^2

9) Compressive strength perpendicular to the direction of the fiber σ = 1,450 kilograms/centimeter^2

For polydirectional laminated plates, but not for unidirectional plates, we measured the characteristics of rigidity and strength of such laminated plates composed of fibers of various proportions in only three directions [±45°, 90°, 0°). We also drew several "carpet type" curves.

The environment affects the performance of resin-based composite materials greatly. Related units have conducted preliminary experiments to study the effects of temperature, humidity, light, saline fog and atmospherice environment upon the performance of composite materials. Data have already been accumulated over 8 year years by the atmospheric aging experiment conducted in the humid environment of the southern part of our nation.

2. Research in Typical Structures

1) Reinforced structure. The reinforcing members and the face plate of the reinforced composite plate can be formed first, and then cemented together. They can also be formed as a whole at once. In the reinforced structure, the reinforcing members must be narrow and long to reduce weight and increase the J value. We tested the stability of shear and axle bearing pressure of this type of structure. Because the cemented surface of the members of second forming was not strong enough, frequently the reinforcing members and the face plate separated, and then the shear or axle bearing pressure of the face plate became unstable.

2) Cap-shaped reinforcements. Sealed thin wall bars made of composite materials possess a higher bending strength and torsional strength. The direction of the fibers in the cap-shaped reinforcements on the web was ±45° to bear shear stress. On the flange, several 0° layers were added to bear normal stress. The cap-shaped reinforcements and the face plate can be solidified together at once, and they can also be cemented together. When the relatively weak stripping strength of cementation is a concern, bolts at a fixed distance apart can be affixed on the cemented surface.

3) Honeycomb. Graphite fiber reinforced composite materials were used to replace aluminum plates in producing honeycombs (see Figure 1). In this type of structure, certain isolation measures must be used to prevent electrochemical corrosion of

different materials. If the composite material used for the face plate of the honeycomb is relatively thin, moisture will infiltrate the inner layers, causing the honeycomb core to corrode and lowering the performance of the cement. At present, we are studying preventive measures.

4) Special types of shaped materials. These include materials in the shape of a trough and materials in "Z" shape.

3. Structural Design and Analysis of Strengths

In recent years, concerned departments in the nation have checked the designs and strengths of some specific structural components and have developed analyses of stress and stability of solid core boards, plyboards and reinforced boards. On the other hand, they have begun research in computational methods and have also begun to compile stress analysis programs and lamination design programs for composite materials. In addition, research on stress concentration in holes will be launched.

4. Research in Technological Methods

Because material forming and structural forming of spare parts made of composite materials are completed at once, therefore, more technological problems have emerged. In addition, technological factors greatly affect the quality of manufactured parts made from composite materials. In particular, because the present means of inspection are not complete, the assurance of quality of products mostly relies on technological measures. To insure repeatability of the technology, we are presently developing research in mechanization and automation while studying technological methods. We have already successfully developed a mechanized spreader and will develop an automatic laminating machine.

Development of Spare Parts for Aircraft

To accumulate experience in our development of graphite fiber reinforced members for aircraft, we first selected some spare parts that do not bear strong forces and that are also easy to observe:

1. Cap of Starter Box

This is situated on top of the [illegible] of the forebody of the aircraft. Its dimensions are 320 x 310 centimeters. The original cap was a milled aluminum alloy component weighing 628 grams. The cap made of composite materials uses the reinforced structure and weighs 427 grams, a reduction of 32 percent in weight. This cap mainly bears aerodynamic loads. Using the elements taken from the cap for testing, we found that the major performance indices all reached or approached those of the LY12 aluminum alloy. The critical loads of the axle bearing pressure and the shear of the cap element were 195 percent and 215 percent of the designed values, respectively. Deflection under lateral pressure was 2.02 centimeters. The graphite fiber reinforced cap and the fuselage were connected by the former support screw cap of metallic structure used previously so as to facilitate installation and observation. We used this method in the whole fuel tank vibration test. Under stress equivalent to an overload of 1.5 g to 2 g, we conducted resonance tests and vibration strength tests. In the vibration strength tests, the cap was subjected to a low frequency assessment of 19.4 hertz and medium and high frequency assessments (30-80 hertz, 80-120 hertz, 120-200 hertz). At a frequency of 120-200 hertz, the frequency of the cap reached the testing vibration value, i.e., at 4.8 g, 11.9 hours, it was subjected to an equivalent of over 8.4 million times of vibration proof assessments. No abnormalities were discovered during or after the tests. The cap made of composite materials was installed for flight testing in October 1975, and the performance was good.

2. Outside Wall of the Intake Duct

Situated on the forebody, it is a hyperboloid wall plate with outer shape requirements on both sides. Its outer surface is the outer shape of the aircraft. The shape of its inner surface is that of the nozzle throat of the air intake duct. We used the following designing principles:

1) The outer shape should satisfy the requirements for outside metallic walls;
2) The thickness should approach that of the outside metallic wall without requiring maximum structural efficiency;
3) The currently available design concepts and manufacturing methods should be utilized as much as possible;
4) There are no limitations in use.

There are two states of critical force acting on the air intake duct, ground test runs ($n = n_{max}$) and high speed dive ($n = 0$). Viewing the forces acting upon the outside wall and the transmission of force, we know that the former requires the outside wall to have good girth rigidity while the latter is similar to the strength problem of a cylindrical shell subjected to internal pressure. Obviously, the former is the main state of the design.

Before designing lamination, we considered the following problems:

1) Structural form. The outer metallic wall is a riveted structure consisting of an inner and an outer envelope with sandwiched girdle pads placed at a definite distance apart. The outer wall itself is a hyperboloid surface with slots for fitting aircraft cannons, therefore the contour surface is more complex. We compared it to the structural forms that can be produced at present and finally used the solid core shell structure.

2) Thickness. The thickness of the replaceable outer metallic wall was 10 millimeters. The thickness we selected was 8 millimeters.

3) The selection and use of mixed fibers. We referred to foreign research results of adding glass fibers or organic fibers to graphite fibers to increase the impact strength, and we used a mixture of graphite and glass fibers.

Based on the consideration that the rigidity in girth is the major designed state of the outer wall, we used a form of lamination of balanced orthogonally mixed fibers. The ratio of the number of layers of fibers in the longitudinal direction and in girth was 3:1.5. This form of lamination has the following characteristics:

1) It is beneficial to developing the rigid characteristics of the girth fibers. The major constants of this type of lamination are:

$E_{\text{in girth}}$ = 7,790 kilometers/millimeter^2
$E_{\text{longitudinal}}$ = 4,490 kilometers/millimeter^2
$E_{45°}$ = 2,020 kilometers/millimeter^2
G_{xy} = 612 kilometers/millimeter^2
μ_{xy} = 0.0577

2) It has a higher impact strength when the bending rigidity is kept from dropping too much. The mixing of glass fibers is determined by calculating the characteristics of the forces upon the outer wall. We also tested the effect of different amounts of glass fiber mixtures upon the bending rigidity. The results showed that when the volume of the glass fiber in the mixture is 58 percent, its bending rigidity is still 83.6 percent that of pure graphite fiber reinforced composite materials, but the impact strength is increased nearly twofold (to 149 kilometers.centimeter/centimeter^2).

3) There is sufficient shear strength. We tested curved plates of a dimension of 500 x 500 x 2 centimeters, R = 500 centimeters. The shear failure load was 8,050 kilometers.

4) This type of lamination has a good vibration proof characteristic. We placed a single structural component made of mixed fiber composite materials and a riveted aluminum structural component together on a vibrator and conducted excitation tests at accelerations of 100 g to 120 g. The aluminum structural component cracked after 2 hours, but the harmonic oscillation frequency of the structural component of composite materials remained basically unchanged after 12 hours of vibration, indicating that there was no internal separation of layers.

5) (0/90) lamination is a typical orthogonal anisotrophy, there is no shear coupling, therefore it is relatively simple.

Forming of the outer wall of composite materials was done in a hot-press chamber (see Figure 2). The problems encountered during the manufacturing process included the selection of materials for the mold and the design of the shape of the mold, problems in controlling the amount of glue, preventing deformation due to technological factors, controlling the thickness tolerance and the smooth finish of the surface, applying external pressure, preventing internal defects, and stopping corrosion due to contact of different materials.

A total of six components were pressed and manufactured in 1977. Their thickness, deformation, surface states and glue content basically met the requirements (see Figure 3). When the thickness of the outer wall of the mixed composite material was 8 millimeters, the component was still lighter than the riveted aluminum structure by 21 percent.

Static simulation tests were conducted by correlation. Figures 4 and 5 show the tests of the air intake duct subjected to two types of forces. The test results are as follows:

1) When the aluminum alloy outer wall was subjected to internal pressure equivalent to 67 percent of the designed load, normal displacement was about 20.9 millimeters. When the load was increased to 100 percent and then unloaded, the two ends of the test sample produced a residual deformation of 7 millimeters and 8 millimeters, respectively.

Under the same conditions, normal displacement of the mixed fiber outer wall was about 9 millimeters and the two ends did not produce residual deformation.

2) The aluminum alloy outer wall began to produce pa-pa sounds when subjected to an external pressure equivalent to 81 percent of the designed load, and localized imbalance occurred. When the load was 113 percent, the imbalance intensified, and when it increased to 128 percent, the whole piece lost balance and failed. Thirty-eight rivets were broken.

The mixed fiber outer wall produced a slight noise only when the load reached 323 percent. When the load reached 372 percent, bulges occurred between the front and back sealed frames. When the load was 396 percent, each displacement point and each point of strain underwent sudden change and the load was automatically discarded. This showed the whole body had lost balance. After discarding the load, deformation disappeared; therefore it was an elastic loss of balance of the whole body. Observation revealed only localized torn surface fibers. Separation of the layers inside the material was not observed.

The above tests showed that compared to the 10-millimeter riveted aluminum outer wall, the rigidity and strength of the 8-millimeter mixed fiber outer wall were much better. If the thickness of the mixed fiber outer wall can be thinned to 6 millimeters, the load that produces an imbalance of the whole body can still reach 178 percent of the designed load. Obviously, the weight can be further reduced and the area of the nozzle throat further increased.

The mixed fiber outer wall is riveted to the fuselage. The distance between the heads and between the sides was taken at 3 d, the distance in between was taken at 5d (d = diameter of the rivet). To examine the above specifications, the ring of rivets joining the aluminum plate of a square hole and the plate of composite materials of a square hole fitted to the first was subjected to an 8×10^4 fatigue test. The result proved it was safe. The mixed fiber outer wall was installed on the test aircraft in April 1978. After it was installed, a protective coating of paint was applied to prevent infiltration of moisture. After many ground tests, it was subjected to its first flight test in December 1978, and the performance was good.

Development of the Engine Blade

The rotor blades of the fan and the air compressor are the parts of an engine's low temperature components that are the most complex and that are subjected to the greatest force. To reduce the weight of the rotor in design, the first requirement is the use of a material with a greater specific strength. Then, because the rotor blades must bear a very large alternate stress, the material must also possess a good fatigue strength. In addition, the specific rigidity is also an important parameter because the self-excited vibration frequency is proportional to the square root of the ratio between the modulus of elasticity and the density. Combining a high modulus of elasticity and a low density can increase the self-excited vibration frequency of the material, avoid the occurrence of resonance within the range of the running speed of the engine and prevent premature damage. The processability of the material is also an important index in selecting the material. Low pressure air compressor blades are the most numerous of an engine's parts. Therefore, good processability is effective in reducing the cost of the engine.

According to the above analysis, we developed two types of blades made of composite materials.

1. Fan Blades

The fan blade in aircraft engines is over 400 millimeters long, the angle of torsion is large, and the contour surface is complex. The use of titanium alloys to manufacture the blades generally requires over 20 procedures--rough forging, cutting and processing, grinding, etc. The amount of work is great. But manufacturing graphite fiber reinforced fan blades is relatively simple. After layers of fibers are laid and laminated inside the mold, the blade can be molded and formed at once, and generally it does not need much processing.

To increase the antibuffeting property of the titanium alloy blade, a damping lobe is added at the midsection on each of the two sides of the blade. Because graphite fiber reinforced composite materials possess a very high rigidity coefficient and a damping coefficient, these damping lobes can be completely eliminated. The graphite fiber reinforced fan blades which we developed (see Figure 6) are lighter than the titanium alloy blades by 60 percent. The tenon failure strength of the graphite fiber reinforced fan blades is 15 tons, basically satisfying the designed requirements. But they need further improvement in structure. Analysis of the three dimensional photoelasticity of the dovetail showed the following problems:

1) Sectional stress σ_y at the root of the blade is relatively large mainly because of the sudden structural change there while the sectional area is the smallest; therefore the gradient of stress is larger.

2) Sectional stress σ_y of the root of the blade along the X axis is asymmetrically distributed. The patterns of distribution of σ_y of the sections along the Z axis are not similar. The σ_y value at the back of the blade near the exhaust side is larger, and this is one of the major reasons that caused the fibers along the edge of the exhaust to be pulled off first during the blade's root pulling test.

Actual measurements of the static vibration frequency of the blade showed that the vibration frequencies of first order bending of the graphite fiber reinforced fan blade were all higher than those of the titanium alloy blade. This showed that the rigidity of the fan blade of composite materials in resisting bending vibrations is not lower than that of the titanium alloy blade, but the torsional vibration frequency is lower than that of the titanium alloy blade. This was because the torsional shear modulus of the titanium alloy is higher than that of the composite graphite fiber epoxy resin material, and the damping lobes on the titanium alloy blade also strengthened the torsional rigidity of the blade.

The logarithmic attenuation of vibration of the blade indicates the magnitude of the internal damping characteristics of the blade. It is one of the indices to evaluate actual vibration-proof characteristics of the blade. Tests have shown that the logarithmic attenuation curve of the graphite fiber reinforced blade is a gentle curve. This means that the larger the vibration stress of the graphite fiber reinforced blade, the larger the internal damping, and they increase in multiples along with increments in stress. The vibration stress of the titanium alloy blade increases slowly and it is a variable. The logarithmic attenuation of the graphite fiber reinforced fan blade was five times that of the titanium alloy blade measured under the same stress. Obviously, from the point of view of vibration absorption, graphite fiber reinforced composite materials are very superior.

2. Rotor Blades

The use of graphite fibers to manufacture secondary rotor blades for the air compressor was aimed at solving the problem of the aluminum alloy blades, which broke when corroded by sea water.

The blade consists of several dozen fiber layers. Each layer of fiber is tailored according to the sample. The direction of the fibers is determined by the characteristics of forces acting upon the blade. The rotor blades of the air compressor mainly bear centrifugal force. Therefore, most of the fibers are arranged along the central arc of the blade. In addition, the blades are also subjected to torsion, so several oblique layers have to be added. The further away the 45° oblique layer is from the center of the blade, the more visible the function of balancing the torque. For this reason, it is generally laid as the outer layer. After each layer has been laminated in order, the temperature is increased and they are solidified under pressure to form the graphite fiber reinforced blade.

The tenon failure strength of the graphite fiber reinforced rotor blade is three to four times the designed load. The torsional rigidity of all sections of the blade satisfies the designed specifications. The graphite fiber reinforced blade performed well in single-stage and two-stage test runs and in the single-stage blade excess speed test and the special 10-hour indoor test run.

Our nation's graphite fiber reinforced blades have not yet entered the trial stage. But viewing the data and the technological characteristics already obtained, graphite fiber reinforced composite blades have a future for development.

Brief Conclusion

Graphite fiber reinforced composite materials are a multidisciplinary frontier science involving high polymer chemistry, mechanics, surface chemistry, and computational mathematics. From the engineering point of view, it includes many specializations in materials, technology, design, strength and testing. Therefore it must be uniformly planned and arranged on an overall basis.

To hasten the development of graphite fiber composite materials, we must emphasize research in basic theory, we must start out from stabilizing the properties of raw materials and supplementary and auxiliary materials, and we must also emphasize the study of testing techniques.

At the same time, we must grasp applied research in graphite fibers well. Application not only can test the results of basic research, it can also provide new topics for basic research, and via actual cases, strength calculations can be concretely carried out, structural plans selected, technological methods studied and the development of nondestructive testing promoted.

FIGURE CAPTIONS

1. p 40. Honeycomb of composite materials.
2. p 40. Hot-press chamber used for forming.
3. p 40. Left and right outer wall plates.
4. p 41. First of the testing states of the air intake duct subjected to force.
5. p 41. Second of the testing states of the air intake duct subjected to force.
6. p 42. Graphite fiber reinforced fan blade.

9296
CSO: 4008/47

PLATE GLASS PLANT UPGRADES TECHNOLOGY, IMPROVES PRODUCTION

Kunming YUNNAN RIBAO in Chinese 8 Dec 81 p 2

[Article: "Using Technology to Rectify a Negative Production Situation"]

[Text] The Kunming Plate Glass Plant has exploited unused potential and has modernized and redesigned its main production line, with excellent results. The design production capacity has now been increased from an initial 750,000 standard crates a year to 900,000 standard crates, a rise of 20 percent, while actual production capacity has increased 2.3 times over the average value (since commissioning) of 300,000 standard crates, and now stands at nearly a million standard crates per year.

Since the plant went into operation in 1970, plate glass output had consistently been unable to reach the design figure, product quality was poor, and the enterprise had lost money year after year, with the result that by 1979 cumulative losses equaled the original investment in the plant. In order to rectify this negative situation, with the assistance of the higher-level cognizant department and relevant organizations, the plant decided to carry out process and equipment modernization on its plate glass production line. Personnel were sent on frequent trips to sister organizations in other provinces to benefit from their experience, and a conscientious analysis and investigation of every stage of the original process design was made in the light of problems which had emerged during production. By pooling their ideas, they came up with design improvements and developed a set of specific measures to be taken. After a year's preparatory work, in January of last year they took the opportunity of a furnace stoppage for overhaul, scheduled once every 2 1/2 years, to reconstruct the entire production line.

During the reconstruction process they brought into play their revolutionary spirit of self-reliance and arduous struggle and carried out careful calculations and strict budgeting, resulting in financial savings. Other than 1.09 million yuan worth of earthmoving work which was contracted to the province's No 5 construction company, all of the remaining more than 1 million yuan worth of work, from mechanical design to construction work, was done by the plant itself. The work of reconstructing the foundation for the main furnace was arduous, so they held a shop competition, and were actively at work even on rainy days; they saved time by proceeding energetically with equipment installation. At the same time, they accorded full importance to saving materials. Because they would have needed 100 cubic meters of wood when they disassembled the 790-square-meter reinforced concrete roof, they devised a way of building the new roof as the old one was disassembled, saving more than 10,000 yuan in funds and creating excellent conditions for subsequent work on the project. Because of their careful calculation and careful budgeting in every aspect of the project, the total investment saving was more than 200,000 yuan.

After 5 months' effort, they successfully completed expansion of the melting furnace, widening of the drawing unit and alteration or new installation of 276 pieces or sets of equipment, making the process more efficient and raising output capacity and quality. Last year, even though the plant was shut down for half the year, they realized a profit of 130,000 yuan, reversing their negative situation; between January and October of this year they made a profit of 1.6 million yuan, and Class 1 products increased from 0.71 percent to 36.9 percent of their total output.

8480
CSO: 4008/58

APPLIED SCIENCES

BRIEFS

HEILONGJIANG FLUORESCENCE SPECTRUM--(Ma Zuguang), associate professor at the Harbin University of Industry in Heilongjiang, has made use a brand new excitation mechanism to develop a near infrared continuous fluorescence spectrum [Jin Hong Wai Lian Xu Ying Guang Guang Pu], thereby fulfilling the long-cherished wish of scientists. Scientists in the United States, West Germany and Italy have been trying to locate a laser material that could produce the near infrared continuous fluorescence spectra in order to manufacture high-power continuous frequency modulation laser and increase resistance against interference in communications and remote sensing. Tests on (Ma Zuguang's) finding show that it can meet these requirements and that it is of significance to the military and the civilian sector. [OW111053 Fujian Front PLA in Mandarin to Taiwan 0300 GMT 10 Jan 82]

SHANDONG CLOSED CIRCUIT--A direct closed circuit between Yantai and Weifang, Shandong Province, opened on 16 December 1981. The opening of the circuit has shortened the transmission time for telegrams between the two places. [SK031325 Jinan Hsnadong Provincial Service in Mandarin 2300 GMT 2 Feb 82]

RADIO TELESCOPE DEVELOPMENT--Nanjing, 1 Feb (XINHUA)--China's first radio telescope, with a frequency of 9,400 megaherts, has been developed by the Zijinshan observatory under the Chinese Academy of Sciences. The successful manufacture of the telescope is of great importance to national defense, the development of remote sensing technology and astronomical research. Test use has determined that its performance is good. [OW030415 Beijing XINHUA Domestic Service in Chinese 0012 GMT 1 Feb 82]

XU TELI'S COLLECTED WORKS--Changsha, 2 Feb (XINHUA)--The Hunan People's Publishing House has published the works of Xu Teli, a Chinese proletarian revolutionary and educator, and another book about him marking his 105th birthday, according to the publishing house. Xu Teli, who died in 1968, wrote many articles of Marxist-Leninist philosophy, political economics and pedagogy. His collected works has 149 articles, letters and diaries written between 1914 and 1965. They were compiled by the Changsha Teachers' Institute where he worked in his early years. The book, "In Memory of Comrade Xu Teli," includes birthday congratulations and laudatory poems by the party Central Committee and Mao Zedong, Zhu De and other older-generation revolutionaries. [Text] [OW030415 Beijing XINHUA in English 0708 GMT 2 Feb 82]

CENSUS ELECTRONICS--Beijing, 1 Feb (XINHUA)--China will use 29 electronic computers to compute the enormous amount of data in its third national population census. Electronic computers stations are being constructed in various provinces, municipalities and autonomous regions. The general census is scheduled to begin on 1 July this year. Of the 29 electronic computers, 21 were given as aid by the United

Nations population activity fund. The other 8, which China bought, were assembled in 1980 and have been used for computing population data on a trial basis. [OW030415 Beijing XINHUA Domestic Service in Chinese 0009 GMT 1 Feb 82]

YUNNAN, GUANGDONG GOOD HARVESTS--Beijing, 2 Feb (XINHUA)--Yunnan and Guangdong Provinces reaped good 1981 harvests of grain, sugar cane, jute, hemp, peanuts, silk cocoons and soy beans, the provincial agricultural departments said. Yunnan harvested 8.9 million tons of grain last year despite a decrease in growing areas. The grain figure was 2.8 percent more than the peak year of 1980. Output of oil-bearing crops, tobacco, tea and sugar cane grew between 6 percent and 50 percent from 1980. Output of major industrial crops also achieved records. As a result of the record grain harvest, 1,500 of the 2,500 production teams in the mountainous Nujiang autonomous prefecture became self-sufficient in food. Guangdong reported a good harvest of industrial crops and improved development of sideline production last year, despite a decrease in grain output. The province was hit by typhoons in the early and late rice period, and a cold spell and waterlogging in the autumn. Compared with 1980, output of sugar cane, jute, ambary hemp, peanuts, bananas, litchis, oranges, pineapples, tobacco and tea grew between 7.7 percent and 45 percent. [OW030415 Beijing XINHUA in English 0817 GMT 2 Feb 82]

WORLD'S FIRST DIPHOTON LASER--Beijing, 29 Jan (XINHUA)--While working with the Applied Physics Institute of Heidelberg University, West Germany, Zhang Daozhong, a researcher of the physics institute of the Chinese Academy of Sciences, successfully developed the world's first diphoton laser in cooperation with West German scientists. [OW290945 Beijing XINHUA Domestic Service in Chinese 0053 GMT 29 Jan 82]

SHANDONG LASER SCANNER--An automatic laser level scanner developed by the Shandong Provincial Laser Research Institute and the Provincial Construction Bureau has been examined by the provincial academy of sciences and other relevant departments. It meets international standards. The TX-2 automatic laser level scanner is used in surveying roads. It can also be used as a plumbing instrument. [SK190630 Jinan Shandong Provincial Service in Mandarin 2300 GMT 17 Jan 82]

SHANGHAI ELECTRONIC CALCULATOR--A new type of electronic calculator has been developed in Shanghai. Known as DJS-130 B calculator, the new product was successfully trial manufactured by the 1932 research institute under the fourth ministry of machine building and the Zhongxing Radio Plant. The calculator is small, performs many functions reliably and is cheap. [OW201415 Shanghai WEN HUI BAO in Chinese 7 Jan 82 p 1]

CSO: 4008/93

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TITLE: "CAD of Waveguide Band-pass Filters with Planar Circuits"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 4, 1981 pp 1-11

TEXT OF ENGLISH ABSTRACT: This paper describes a computer program for designing waveguide band-pass filters with planar circuits. The program is developed by means of microwave filter synthesis theory and the analysis of equivalent reactances of waveguide inductive strips. This program determines the dimensions of filter configurations, including the number of inductive strips, width of strips and the separation between two adjacent strips. Parameters to be specified by the user are as follows: width of waveguides, thickness of strips, pass-band frequencies, pass-band insertion attenuation ripple and minimum insertion attenuation at a specified frequency in stop-band.

The program uses BASIC language. A number of trial x-band filters were calculated in the DJS-131 computer and tested in the laboratory. The experiment results were in agreement with the specifications given beforehand.

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et al.

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TITLE: "Experimental Investigation of Electron Cyclotron Maser"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 4, 1981 pp 12-19

TEXT OF ENGLISH ABSTRACT: In this paper, the results of an experimental investigation of ECM are presented. The design consideration of the experimental model is discussed in detail. The method of calculation with the aid of a computer of the nonlinear interaction between electron and field-wave in gyromonotron is included. Based on the calculated results, the prototype design is revised. Finally, an analysis of the experimental results is given.

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TITLE: "Efficiency Calculation and Operating Parameters' Optimization of Gyrotron"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 4, 1981 pp 20-27

TEXT OF ENGLISH ABSTRACT: In this paper equations of nonlinear orbit of a gyromonotron in cylindrical interaction space are derived from the relativistic dynamic equation of particles. A method of calculating the efficiency of energy transformation is presented, and the relevant computer program is derived. Based on numerical calculations of the efficiency for a Ku-band gyromonotron working at the fundamental cyclotron harmonic, the operating parameters are optimized.

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TITLE: "A Numerical Solution of Open Resonators with Slowly Varying Section"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 4, 1981 pp 28-35

TEXT OF ENGLISH ABSTRACT: In this paper, a method of numerical calculation for open resonators with a slowly varying section is given. Some important problems in this numerical method are discussed. One of the results is that the calculated value of the diffraction quality factor is independent of the length of the output waveguide. Comparison with measured results shows that the relative error of resonance frequency is less than 0.1 percent, and that of the Q_d value is about 10 percent. Agreement between the measured and calculated field-distributions is excellent.

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TITLE: "Research of Failure Mechanism of TV Tubes"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 4, 1981 pp 36-46

TEXT OF ENGLISH ABSTRACT: In order to extend the life of TV tubes, several factors causing the failure of TV tubes have been studied. The law of variation of residual gas content in TV tubes operating for more than 5000 hours and the residual gas situation in many TV tubes after failure have been analyzed with an omegatron. With the aid of AES, SEM and SIMS the coating and base metal of the oxide-coated cathodes have also been analyzed. It is found that the main source of gas release is the EID of the fluorescent screen, which decreases with time. The influences of coating materials and technology on EID have been measured. The method of reducing EID is discussed. Barium film getter is used to sorb a large number of oxy-gases, but it also introduces quite a bit of argon into the tubes. The sorption mechanism of argon and the method of reducing the argon have been studied in some detail.

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TITLE: "Dynamic Measuring System for Vibration Parameters of Rotating Machines"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 4, 1981 pp 47-58

TEXT OF ENGLISH ABSTRACT: In this paper, a dynamic measuring system for vibration parameters is discussed, which can be used to analyze the performance of a rotating machine during its speed-up. The system includes digitally-controlled-conductance tunable active filters, digitally-controlled sine and cosine components converter, low-frequency wide-band phase-locking frequency-doubling circuits, etc. It can be used to plot curves directly with the help of an x-y recorder, such as the amplitude-frequency and phase-frequency characteristics and the polar diagram of vibration parameters. The auto-tracking frequency filter of the system can be used as a synchro-filter and for automatic analysis of frequency spectrum. Direct plotting of polar diagram is a new function for which no commercial instrument is yet available.

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TITLE: "A Study of the Electroconductive Material--$La_{1-x}Ca_xCrO_3$"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 4, 1981 pp 59-67

TEXT OF ENGLISH ABSTRACT: The process of densification of the MHD electrode material--$La_{1-x}Ca_xCrO_3$, by sintering in air is described. Based on our previously established manufacturing process, the use of an additive provides an effective way of promoting the densification of the material. Under conditions of a synthetic temperature of 1100-1300°C and a sintering temperature of 1650-1700°C, a consolidated body with porosity < 2 percent, volume density > 6 g/cm^3 and about 1Ω--cm electrical resistivity at room temperature are obtained.

In addition, the lattice constants of the material to which 0.5 percent MgO has been added are tentatively calculated as $a = 3.8748$ Å, $c = 3.8498$ Å, $c/a = 0.9935$, showing that it actually has a tetragonal structure. A formula $La_{1-x}Ca_x[Cr_{1-x}(Cr_x \cdot \square)]O_3$ is proposed to explain the mechanism of electrical conduction in $La_{1-x}Ca_xCrO_3$.

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TITLE: "Logic Design of Machine-tool Hydraulic Systems Using Matrix"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 4, 1981 pp 68-92

TEXT OF ENGLISH ABSTRACT: This paper puts forward, for the first time, a novel method using matrix of logic design of machine-tool hydraulic systems. The formation, operation and decomposition of such matrices are discussed, and the decomposibility of the matrix verified.

The paper also shows how to simplify a set of decomposed matrices by means of a "Switching Matrix," and how to transform it back into the hydraulic system layout.

The paper ends with two practical examples with supplementary explanations.

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TITLE: "A Study of Positioning Accuracy of Machining Center--Development of a Reference Model Compound Control System Using Magnetic Scale Measurement"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 4, 1981 pp 93-99

TEXT OF ENGLISH ABSTRACT. A machining center should have high positioning accuracy to ensure its machining precision. This paper introduces a reference model compound control system with magnetic scale measurement used for controlling NC machines. It is proved that this system runs stably and reliably, and can be readjusted conveniently. The comparison of the positioning accuracy has been made between the open loop control system and the reference model compound control system. The positioning accuracy from a definite point is also compared with that from random points when the reference model system is used.

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TITLE: "Study of Reinforced Concrete Bond Specimens by Finite Element Method"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 4, 1981 pp 100-115

TEXT OF ENGLISH ABSTRACT: In this paper, tensile and pull-out reinforced concrete bond specimens are studied by the finite element method. The analysis is solely based on the basic mechanical properties of concrete and reinforcing bar, and other additional assumptions, such as distribution of cracks, bond stress-slip relationship, etc., are not necessary.

The cracked concrete is considered to be an orthotropic body in which the tangent modulus along the crack direction is taken as its initial value E. The shear modulus G' on the cracked surface can be determined by a method described in this paper. The tangent modulus in the direction normal to the cracks is then obtained from E and G'.

In the analysis, although it is assumed that the concrete is connected directly with the adjacent steel, the slip between both materials can be found approximately from the results of the finite element analysis.

[Continuation of NANJING GONGXUEYUAN XUEBAO No 4, 1981 pp 100-115]

Three typical bond specimens are analyzed. The calculated results for the total elongation and the strain distribution of the embedded reinforcing bar, the strains and the distribution of the internal cracks in concrete as well as the bond stress-slip relationship are essentially in good agreement with the experimental data published in the foreign literature.

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TITLE: "Some Problems in the Field Measurement of Airborne Sound Isolation of Dwellings"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 4, 1981 pp 116-123

TEXT OF ENGLISH ABSTRACT: This paper discusses some causes of variation of results in field measurements and calculations of airborne sound isolation of dwellings, which includes the frequency range of the measurements, the position of the measuring points, calculation of SPL difference for normalization, evaluation of decay curves of reverberation, location and structure of the source room and the receiving room. Some suggestions have also been put forward.

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TITLE: "Application of the Theory of Matrix and Interpolation to the Natural Vibration of the Circular Arches"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 4, 1981 pp 124-139

TEXT OF ENGLISH ABSTRACT: Based on the author's previous work, this paper further studies the natural vibration of the circular arches. In order to improve the accuracy of the solution, we have derived the elastic load matrices by using the parabolic interpolation polynomial. To illustrate the solution method, several numerical examples are presented in this paper. The calculated results, which are applicable to engineering designs, are given in tables and plotted in graphs.

Finally, we have compared the dynamic behavior of circular arches with that of parabolic arches.

9717
CSO: 4009/234

AUTHOR: QIAN Weide [6929 0787 1795]

ORG: Department of Automation

TITLE: "The Structural Asymptotical Stability of Linear Multivariable Systems"

SOURCE: Beijing QINGHUA DAXUE XUEBAO [JOURNAL OF QINGHUA UNIVERSITY] in Chinese No 4, 1981 pp 1-13

TEXT OF ENGLISH ABSTRACT: In this paper, some ideas of structural asymptotical stability and unchanged order are presented. The proper definition of systems nondegeneracy is given. The sufficient and necessary conditions of the nondegeneracy and structural asymptotical stability for complex systems (parallel systems, series systems and closed systems) are proved.

By using the above conclusions the nondegeneracy condition of systems without steady errors is analyzed successfully. This paper shows that the nondegeneracy condition is not only one of the sufficient conditions, but also a necessary condition of realizing systems without steady errors. Therefore, research on systems without steady errors has been developed here.

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ORG: Department of Thermal Engineering

TITLE: "A Study on the Hodograph Method to Design the Transonic Cascade"

SOURCE: Beijing QINGHUA DAXUE XUEBAO [JOURNAL OF QINGHUA UNIVERSITY] in Chinese No 4, 1981 pp 15-23

TEXT OF ENGLISH ABSTRACT: A new way of using the hodograph method to design the transonic turbine cascade is given. In the subsonic region, the potential equation in hodograph is applied, while in the transonic region the generalized Tricomi approximation is applied. Differential schemes and calculated results are given.

AUTHOR: QI Minggao [2058 7686 4108]

ORG: Department of Applied Mathematics

TITLE: "On the Differences of Primes in Arithmetic Progressions"

SOURCE: Beijing QINGHUA DAXUE XUEBAO [JOURNAL OF QINGHUA UNIVERSITY] in Chinese No 4, 1981 pp 25-36

TEXT OF ENGLISH ABSTRACT: Let ℓ, R be the relatively prime positive integers with R even, and p_i denotes the i-th prime in the arithmetical progression $\ell + \nu R$, $\nu = 0, 1, 2, \ldots$, and for each positive integer r we define

$$E_r = \liminf_{i \to \infty} \frac{p_{i+r} - p_i}{\varphi(R) \log p_i}$$

where $\varphi(R)$ is the Euler function. Our principal results may be stated as follows:

Theorem 1. For each positive integer r we have

$$E_r < \frac{2r-1}{4r} \left\{ (2r-1) + \frac{\pi}{4} \right\}$$

[Continuation of QINGHUA DAXUE XUEBAO No 4, 1981 pp 25-36]

Theorem 2. Let θ_r be the unique solution of the equation

$$\theta_r + \sin\theta_r = \frac{\pi}{4r}$$

Then

$$E_r < \frac{2r-1}{16} \left\{ 4r + (4r-1) \frac{\theta_r}{\sin\theta_r} \right\}$$

In this paper, a detailed proof of Theorem 1 is given, and Theorem 2 may be obtained by a similar method.

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TITLE: "The Soliton in Liquid Crystals and Its Possible Biological Functions"

SOURCE: Beijing QINGHUA DAXUE XUEBAO [JOURNAL OF QINGHUA UNIVERSITY] in Chinese No 4, 1981 pp 37-44

TEXT OF ENGLISH ABSTRACT: Based on a simplified model, a Sine-Gordon equation in nematic liquid crystals is discussed and deduced. It is shown that in liquid crystals a soliton can be created, and may possess some important biological functions.

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TITLE: "Real Operational Fast Fourier Transformation"

SOURCE: Beijing QINGHUA DAXUE XUEBAO [JOURNAL OF QINGHUA UNIVERSITY] in Chinese No 4, 1981 pp 45-61

TEXT OF ENGLISH ABSTRACT: Real operational fast Fourier transformation is referred to as the RFT method. Its distinguishing features are: making full use of row and column symmetries of [W] matrix elements in Fourier transformation and making proper combination of these symmetrical matrix elements and then combining the multiplications which appear repeatedly in direct Fourier transformation so as to finally become the most necessary multiplications and a certain number of additions. Although the RFT method does not change the law in which the number of multiplications varies with the square of the matrix order N, due to the cancellation of repeated multiplications the number of multiplications reduces from N^2 to $N^2/24$ or so, and therefore the RFT method saves a lot of operation time.

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TITLE: "Effect of Agglomerates on the Sintering of Alumina"

SOURCE: Beijing QINGHUA DAXUE XUEBAO [JOURNAL OF QINGHUA UNIVERSITY] in Chinese No 4, 1981 pp 63-70

TEXT OF ENGLISH ABSTRACT: The effect of different sizes and distributions of agglomerates on the prefired and sintered densities of alumina has been studied. NiO-doped alumina slips of different agglomerate sizes and distributions were prepared by using different stirring times. Samples were than formed by slip casting, dried at 50°C, prefired and then sintered at 1050°C and 1735°C respectively. The sintering behavior of agglomerates is considered in terms of the microstructure of agglomerates and sintered samples. The sintered density of samples which were formed from a slip stirred for 6 minutes was much lower than that stirred for 36 minutes. The agglomerate size reduced greatly through stirring for 120 minutes and the density of the sample increased to 98.5 percent of the theoretical density.

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ORG: All of the Department of Chemistry and Chemical Engineering

TITLE: "Calculation of the Electronic Level of Sensitive Dye Molecules"

SOURCE: Beijing QINGHUA DAXUE XUEBAO [JOURNAL OF QINGHUA UNIVERSITY] in Chinese No 4, 1981 pp 71-82

TEXT OF ENGLISH ABSTRACT: The eigenpolynomes of 16 sensitive dye molecules, including quinocyanine, thiacarbocyanine, oxacarbocyanine and selenacarbocyanine, were derived with the aid of the Molecular Orbital Graph Theory. Energies of the molecular electronic levels obtained by solving these polynomes were also presented. The resonance integral β was evaluated with linear regressive analysis. Values of excited energies and reduction half-wave potential of these dyes were paralleled with each other, being in complete agreement with the published experimental data. All these calculations were performed with only a programmable pocket calculator.

AUTHOR: ZHU Guozhen [6175 0948 2823]

ORG: Department of Fundamental Courses

TITLE: "A New Kind of Mechanical Wave--Curvature Elastic Wave in Liquid Crystals"

SOURCE: Beijing QINGHUA DAXUE XUEBAO [JOURNAL OF QINGHUA UNIVERSITY] in Chinese No 4, 1981 pp 83-90

TEXT OF ENGLISH ABSTRACT: In a thin film of nematic liquid crystals whose "director" has a perpendicular alignment to the glass base plate, a new mechanical wave caused by the disturbance of the "director" is excited by a mechanical method. The wave was predicted by Fergason and Brown previously and discussed theoretically by many authors.

This new wave was observed between two perpendicular polarizers and some photos were presented. The wavelength remains approximately the same value ($\lambda = 7.2$ cm) for different frequencies ($f = 2\text{-}20$ Hz).

In our primary analysis we ignored the dispersive process caused by viscosity and have postulated that the disturbance of the "director" takes place in a thin layer L which is smaller than the thickness of the cell (i.e., $L < d$), and L is inversely proportional to the frequencies of the wave ($l \propto 1/f$, or $L = b/f$), where b is a constant having an approximate value of $3.7 \text{ cm}\cdot\text{sec}^{-1}$.

AUTHOR: LIU Guangjun [0491 1639 0971]

ORG: Qinghua University

TITLE: "A Model Equation of the Boltzmann Equation for Binary Gas Mixtures"

SOURCE: Beijing QINGHUA DAXUE XUEBAO [JOURNAL OF QINGHUA UNIVERSITY] in Chinese No 4, 1981 pp 91-100

TEXT OF ENGLISH ABSTRACT: A model equation of the Boltzmann equation for binary gas mixtures is deduced in this article. This model equation satisfies the macroscopic conservation equations of mass, total momentum and total energy, satisfies the H theorem, and possesses the same solutions as the Boltzmann equation in both molecular flow and viscous flow limits. Thus this model equation may be used instead of the Boltzmann equation to discuss approximately the motion of gases in the transient region between molecular flow and viscous flow limits.

AUTHOR: SHEN Mengyu [3088 1322 5148]
ZHOU Sheng [0719 4141]

ORG: SHEN of the Department of Engineering Mechanics, Qinghua University; ZHOU of the Department of Jet Propulsion, Beijing Institute of Aeronautics and Astronautics

TITLE: "An Investigation of the Ways of Solving Three-dimensional Transonic Flow Fields in Turbomachinery"

SOURCE: Beijing QINGHUA DAXUE XUEBAO [JOURNAL OF QINGHUA UNIVERSITY] in Chinese No 4, 1981 pp 101-104

TEXT OF ENGLISH ABSTRACT: Two different methods of solving three-dimensional transonic shocked flow fields in turbomachinery are compared and the mistakes which exist in Wu, et al's method are analyzed. None of the three programs given by Wu et al can be used to compute the transonic shocked flow fields on the S_1 stream surfaces. On this basis, the following preliminary concluding remarks were obtained: The theory of two kinds of relative stream surfaces S_1 and S_2 might not necessarily be a good method for solving three-dimensional transonic shocked flow fields in modern turbomachinery. On the other hand, the methods for solving three-dimensional flow fields directly might have some merit for recommendation.

9717
CSO: 4009/233

AUTHOR: None

ORG: The Committee of Education and Qualification, NDT Institution of CMES

TITLE: "The Training and Technical Gradational Qualification for NDT Personnel in China"

SOURCE: Shanghai WUSUN JIANCE [NONDESTRUCTIVE TESTING] in Chinese No 6, 1981 pp 1-7

TEXT OF ENGLISH ABSTRACT: This paper gives a brief description of the methods and major problems in training NDT personnel and identifying their technical gradation and qualification according to the conditions of personnel and technical force presently in China. It is an urgent task to train and examine those NDT personnel working in the forefront of production and taking direct charge of testing and evaluation of products, and the most urgent is the qualification examination. The technical grades for NDT personnel in China are divided into three basic classes. The NDT personnel administration in the range of the whole country is performed by a three-class administration. Three years would be better for an effective term of qualification. In case of necessity, the effective term can be prolonged once again, but there must be an examination again after six years for regaining qualification.

AUTHOR: WEI Zhongyuan [7614 0112 6678]
XIE Haifu [6200 3189 4395]

ORG: WEI of Huabei Electrical Test Research Institute; XIE of Tianjin Electrical Construction Company

TITLE: "Development and Application of Miniature Double-crystal Probe"

SOURCE: Shanghai WUSUN JIANCE [NONDESTRUCTIVE TESTING] in Chinese No 6, 1981 pp 8-14

TEXT OF ENGLISH ABSTRACT: The development of the miniature transverse-wave probe with inclining double-crystal probe provides a new means for detection of cracks in the root of welds of small-diameter thin-wall tubes. The probes have been used for inspecting the welds in engineering projects and power plants. Good results are obtained. This article describes the design, fabrication and results of application of the probe.

AUTHOR: HUANG Wei [7806 3837]
ZHOU Qifang [0719 3825 5364]
JIANG Naijie [3068 0035 2638]

ORG: All of the Shanghai Ultrasonic Instrument Plant

TITLE: "The Development of High-damping Ultrasonic Probe"

SOURCE: Shanghai WUSUN JIANCE [NONDESTRUCTIVE TESTING] in Chinese No 6, 1981 pp 15-17

TEXT OF ENGLISH ABSTRACT: This paper introduces the sound resistance conversion in probes by means of multiple limited transition layer technique. Probes with high sensitivity, high resolution and high damping used for wide band and narrow pulses have been successfully produced. Working in cooperation with high precision thickness gauge, it gives a resolution of 0.2 mm and accuracy of ±0.01 mm.

AUTHOR: YAN Hongcai [0917 7703 2088]

ORG: Changxin Machinery Plant

TITLE: "The Proper Choice of Focal Distance in X-ray Radiography"

SOURCE: Shanghai WUSUN JIANCE [NONDESTRUCTIVE TESTING] in Chinese No 6, 1981 pp 18-22

TEXT OF ENGLISH ABSTRACT: There are many factors affecting the quality and sensitivity of X-ray radiography, of which focal distance is an important one. The choice of a focal distance is correlated not only with the tubevoltage and exposure, but also with the shape and thickness of a workpiece to be inspected. The paper discusses the factors which should be considered in choosing focal distance for radiographic inspection of workpieces.

AUTHOR: LI Yan [2621 5888]

ORG: Wuxi Boiler Works

TITLE: "Application of the Simple Radiographic Directional Disc for Examining the End Plate Welds of Boiler Header"

SOURCE: Shanghai WUSUN JIANCE [NONDESTRUCTIVE TESTING] in Chinese No 6, 1981 pp 23-25

TEXT OF ENGLISH ABSTRACT: This paper describes the method for making a simple radiographic directional disc and its application in examining the end plate welds of the boiler header.

AUTHOR: LIN Weizheng [2651 4850 2973]

ORG: Tongji University

TITLE: "The Advance in the Determination of Concrete Quality by Ultrasonic Pulse Method"

SOURCE: Shanghai WUSUN JIANCE [NONDESTRUCTIVE TESTING] in Chinese No 6, 1981 pp 26-33

TEXT OF ENGLISH ABSTRACT: In this paper, the fundamental principles of nondestructive determination of concrete quality by ultrasonic pulse method are introduced. The status of concrete testing technique in China, the techniques for testing the strength and flaws in the concrete, as well as the advance in instrument development are described.

AUTHOR: WAN Guoqing [8001 0948 1987]

ORG: Harbin University of Science and Technology

TITLE: "Application of Electromagnetic Nondestructive Testing Technique Abroad for Determining the Properties of Metals"

SOURCE: Shanghai WUSUN JIANCE [NONDESTRUCTIVE TESTING] in Chinese No 6, 1981 pp 34-40

TEXT OF ENGLISH ABSTRACT: The paper briefly describes the basic principles and the experimental data of various kinds of electromagnetic nondestructive instruments used for sorting steels and determining the properties of metals, such as hardness, depth of case hardening or surface coating, residual stress, tensile strength and grain size, as well as the δ-Ferrite content in the weld metal.

AUTHOR: CHEN Jiansheng [7115 1696 3932]

ORG: Beijing Internal Combustion Engine Factory, General Works

TITLE: "Discussion of the Specification for Longitudinal Magnetization Used in Magnetic-particle Testing"

SOURCE: Shanghai WUSUN JIANCE [NONDESTRUCTIVE TESTING] in Chinese No 6, 1981 pp 41-46, 22

TEXT OF ENGLISH ABSTRACT: In the practice of magnetic-particle testing, the current required strength for longitudinal magnetization used in many factories is widely different.

The working conditions influencing the required strength of longitudinal magnetization in magnetic-particle testing are discussed. The practical problems that may be encountered during testing, the method of selecting the current required strength for longitudinal magnetization and different kinds of inspection equipment are explained.

AUTHOR: MA Dongling [7456 2639 1545]

ORG: Bureau of Metallurgy, Shanghai

TITLE: "The Application of Nondestructive Testing in Metallurgical Industry"

SOURCE: Shanghai WUSUN JIANCE [NONDESTRUCTIVE TESTING] in Chinese No 6, 1981 pp 47-49, 22

TEXT OF ENGLISH ABSTRACT: In order to guarantee the quality of the adaptability and reliability of metallurgical products, gradual adoption of nondestructive testing has already become an important step toward the modernization of metallurgical testing. This paper attempts to discuss some problems from the technical point of view based on the particular situation of China and especially that of Shanghai.

9717
CSO: 4009/232

AUTHOR: JIANG Shangxin [5592 1424 0207]

ORG: East China Institute of Textile Science and Technology

TITLE: "Studies on Acylation of Caprolactam and Hydrolysis of N-acyl Derivatives"

SOURCE: Shanghai HUADONG FANGZHI GONGXUEYUAN XUEBAO [JOURNAL OF EAST CHINA INSTITUTE OF TEXTILE SCIENCE AND TECHNOLOGY] in Chinese No 2, 1981 pp 1-9

EXCERPT FROM ENGLISH ABSTRACT: N-acyl caprolactam (IV) was prepared from caprolactam (I) and an acid chloride (III) in the dioxane solution of triethylamine or pyridine. N-acyl-ε-amino caproic acid (V) was synthesized by hydrolysis of IV with an acetic acid solution. It was also obtained by the acylation of ε-amino caproic acid (II) with the corresponding acid chloride.

AUTHOR: YU Ming [0205 2494]

ORG: East China Institute of Textile Science and Technology

TITLE: "Theoretical Analysis of Hob Grinding"

SOURCE: Shanghai HUADONG FANGZHI GONGXUEYUAN XUEBAO [JOURNAL OF EAST CHINA INSTITUTE OF TEXTILE SCIENCE AND TECHNOLOGY] in Chinese No 2, 1981 pp 10-20

TEXT OF ENGLISH ABSTRACT: This paper deals with hob grinding for involute gears. Strictly speaking, the worm surface of the hob must be an involute helicoid which possesses an intersecting curve in axial plane convex. But this helicoid cannot be generated on a contemporary relieving lathe. Therefore, in engineering, it is often superseded by a helicoid with straight line generator in axial plane. In the backing-off process, the edge of the cutter has a radial motion and, simultaneously, the blank and the relieving tool have a relative helical motion, resulting in a helicoid. In grinding, the hob profile is an enveloped surface of a grinding wheel. This is the fundamental difference between the two processes.

The effort for obtaining a perfect helicoid in grinding has been proved fruitless. This is because, in this case, the conjugate surface of the hob relief is a column face which cannot be superseded by a surface of revolution. As a result, only approximations can be expected.

[Continuation of HUADONG FANGZHI GONGXUEYUAN XUEBAO No 2, 1981 pp 10-20]

There is no doubt that the main reason responsible for deviation in grinding is the configuration and the position of contact lines between hob and wheel. It is found that the optimum condition is for the lines of contact to exist near a straight generator of the hob relief in a horizontal axial plane which coincides with the edge of the relieving tool. We are thus confronted with the problem of how to find the spatial position of a grinding wheel that agrees with the required optimum condition. Imagine a hyperboloid of one sheet intersecting with the helicoid of hob relief with one superimposed curve being the common straight generator of the two surfaces. Generally speaking, there must be another common curve in them and interference must exist between the two superimposed curves. If we change the relative spatial position of the axis of the hyperboloid and adjust its parameters, the interference can be decreased to a minimum. When the interference area is lessened sufficiently, the two surfaces can be conceived as having approximate tangent contact along the horizontal straight generator and thus the optimum position of wheel axis can be ascertained.

The paper goes on to deal with another important problem concerned with finishing accuracy, i.e., the boundary between enveloped area and forming area of the finished hob. In grinding, the radial motion of the grinding wheel is often limited, in that when it reaches a certain position, interference will occur between wheel periphery and the next tooth edge. This position is the final position of the grinding wheel. The remaining area in hob relief is the forming area which retains the configuration of the grinding wheel, in which case no accuracy can be expected.

AUTHOR: HE Minying [0149 2404 5391]

ORG: East China Institute of Textile Science and Technology

TITLE: "A Study of Designing the Loom Conjugate Cam Mechanism (Part I)"

SOURCE: Shanghai HUADONG FANGZHI GONGXUEYUAN XUEBAO [JOURNAL OF EAST CHINA INSTITUTE OF TEXTILE SCIENCE AND TECHNOLOGY] in Chinese No 2, 1981 pp 21-29

TEXT OF ENGLISH ABSTRACT: In this paper, the formulas used to calculate the region for the location of the cam shaft are deduced and shown with examples.

AUTHOR: ZHOU Bingrong [0719 3521 2837]
CHEN Guangyong [7115 0342 0516]

ORG: Both of the East China Institute of Textile Science and Technology

TITLE: "Shape and Tension of Yarn Curve in a Rotor for OE Spinning"

SOURCE: Shanghai HUADONG FANGZHI GONGXUEYUAN XUEBAO [JOURNAL OF EAST CHINA INSTITUTE OF TEXTILE SCIENCE AND TECHNOLOGY] in Chinese No 2, 1981 pp 30-37

TEXT OF ENGLISH ABSTRACT: Based on certain assumptions, a mechanical analysis was made on the yarn curve in an OE rotor. Attempts were made to derive formulas for defining its shape and tension, and to calculate the maximum velocity of the spinning rotor, with single yarn breaking strength set at its lowest. Lastly, an explanation was given of the stability of the curve fluctuations of the yarn in the rotor.

AUTHOR: SHAO Shihuang [6730 0013 3552]

ORG: East China Institute of Textile Science and Technology

TITLE: "General Design of the Computer Monitor System for Looms"

SOURCE: Shanghai HUADONG FANGZHI GONGXUEYUAN XUEBAO [JOURNAL OF EAST CHINA INSTITUTE OF TEXTILE SCIENCE AND TECHNOLOGY] in Chinese No 2, 1981 pp 38-46

TEXT OF ENGLISH ABSTRACT: The computer monitor system for looms is considered a feedback element of man-computer systems with manifold data-processing functions. Man-computer functional allocation and man-computer boundary plane design should be given primary consideration.

In this paper the general design of the computer monitor system is studied in three parts: information processing, information transmission and organizing the system. Also presented is the design diagram for the man-computer system provided with the computer monitor system for looms.

AUTHOR: TANG Zhenmin [3282 2182 3046]
PAN Borong [3382 0130 2837]
WANG Manping [3769 0589 1627]
XU Boran [1776 3202 3544]

ORG: TANG, PAN and WANG all of the East China Institute of Textile Science and Technology; XU of the Shanghai Textile Sciences Research Institute

TITLE: "Measurement of the Dynamic Draw-off Tension on Circular Knitting Machines"

SOURCE: Shanghai HUADONG FANGZHI GONGXUEYUAN XUEBAO [JOURNAL OF EAST CHINA INSTITUTE OF TEXTILE SCIENCE AND TECHNOLOGY] in Chinese No 2, 1981 pp 47-56

TEXT OF ENGLISH ABSTRACT: In this paper the principle and method of the measurement of dynamic draw-off tension on circular knitting machines are discussed. An arc-shaped sensor for measuring the tension was developed and actual measurements were conducted on Interloch machines models Z214 and Z211. The results of operation, supported by a good reproducibility, were found in favorable agreement with actual conditions. Moreover, the sensor is simple in structure and convenient to use. It is therefore recommended as an effective instrument to be applied in further efforts to study the draw-off mechanism and improve the quality of knitted fabrics.

AUTHOR: ZHANG Daichang [1728 0108 2490]

ORG: East China Institute of Textile Science and Technology

TITLE: "Utilization of Computers in Determining Dimensions of the Beating Up Mechanism with Short Connecting Rods"

SOURCE: Shanghai HUADONG FANGZHI GONGXUEYUAN XUEBAO [JOURNAL OF EAST CHINA INSTITUTE OF TEXTILE SCIENCE AND TECHNOLOGY] in Chinese No 2, 1981 pp 57-66

TEXT OF ENGLISH ABSTRACT: The method is applied with the aim of selecting an optimum plan out of a number of applicable designs, with the value of the maximum angular acceleration of the slay at a minimum. The device so designed will not only meet technological requirements of weaving, such as the swinging angle of the slay, the specified precision of the approximate dwelling time, the position of the back dead center, etc., but will also satisfy the necessary mechanical constraint conditions, such as the complete revolution of the crank, the permissible pressure angle, the limited length of the connecting rod, etc. Since the calculating procedure has been made into a source program in ALGOL-60, results can be readily acquired on the 709 computer.

AUTHOR: ZHOU Cinian [0719 1964 1628]
LIANG Jinru [2733 6855 5423]
YAO Meiyun [1202 5019 0061]

ORG: All of the East China Institute of Textile Science and Technology

TITLE: "Methods and Results of Measuring the Twist Distribution in Yarn Cross Section. Part I: A Study on the OE Yarn Twist Problems"

SOURCE: Shanghai HUADONG FANGZHI GONGXUEYUAN XUEBAO [JOURNAL OF EAST CHINA INSTITUTE OF TEXTILE SCIENCE AND TECHNOLOGY] in Chinese No 2, 1981 pp 67-70

TEXT OF ENGLISH ABSTRACT: In this paper, the amount and distribution of twist in the principal man-made OE yarn cross sections are studied. An approach is made and a preliminary solution is found for the problem of the formulation of spinning solution for tracer fibers to be used for observing PET and vinylon OE yarns.

The results show that the rules of twist distribution in man-made OE yarns are the same as for cotton OE yarn. It has also been observed that the measured values of practical twists in man-made OE yarns are the same as those in cotton OE yarn, both being lower than their calculated values. The amount of difference is the largest in polyester OE yarn and the smallest in acrylic OE yarn.

AUTHOR: MU Shuhua [4476 3219 5478]
HUANG Xiangan [7806 6272 1344]
ZHANG Yu [1728 3842]

ORG: All of the East China Institute of Textile Science and Technology

TITLE: "Application of the Two-phase Sonic Modulus Theory in Determining the Change of Amorphous Orientation Function f_{am} in Fibers"

SOURCE: Shanghai HUADONG FANGZHI GONGXUEYUAN XUEBAO [JOURNAL OF EAST CHINA INSTITUTE OF TEXTILE SCIENCE AND TECHNOLOGY] in Chinese No 2, 1981 pp 71-78

TEXT OF ENGLISH ABSTRACT: A number of polymer materials are of a two-phase system which contains both a crystalline phase and an amorphous phase.

It is well known that X-ray diffraction may be used for measurement of crystalline regions orientation function f_c of fibers, but for amorphous regions orientation function f_{am} there still lacks a direct and accurate method for its determination.

Based on W.W. Moseley's sonic orientation theory, R.J. Samuels proposed the two-phase sonic modulus theory and derived the equation as follows:

$$\frac{3}{2E_{sr}} = \frac{\beta}{E^0_{t\cdot c}}(1-f_c) + \frac{1-\beta}{E^0_{t\cdot am}}(1-f_{am})$$

[Continuation of HUADONG FANGZHI GONGXUEYUAN XUEBAO No 2, 1981 pp 71-78]

where,
E_{or}--the measured sonic modulus of the oriented sample;

$E^0_{t\cdot c}$, $E^0_{t\cdot am}$--intrinsic transverse Young's modulus of the crystalline and amorphous regions of the sample;

f_c, f_{am}--the crystalline and amorphous region orientation function of the sample;

β--crystallinity of the sample.

As can be seen from the equation, the $E^0_{t\cdot c}$ and $E^0_{t\cdot am}$ of the fiber sample remain constant. Such being the case, once the sonic modulus E_{or}, crystallinity β and crystalline regions orientation function f_c of the sample are determined, the amorphous regions orientation function f_{am} will be readily available.

High speed PET fiber (6000 m/min) was taken as the sample, which underwent tensile heat setting under different conditions. Thereafter E_{or}, β and f_c were determined and f_{am} was subsequently calculated. Three conclusions can be drawn from these experimental results:
1. The crystallinity of the sample increases with increasing temperature of heat setting, whereas the amorphous orientations function f_{am} gradually decreases.
2. f_{am} of the sample increases with increasing load of heat setting, and shows a linear relationship to the latter.

[Continuation of HUADONG FANGZHI GONGXUEYUAN XUEBAO No 2, 1981 pp 71-78]

3. The slopes of curves showing the variation of f_{am}, which varies with the load, are different at different temperatures. The higher the temperature, the bigger the slope.

AUTHOR: HUANG Cipei [7806 2945 3099]
LI Weihan [2621 4850 3352]
et al.

ORG: All of the East China Institute of Textile Science and Technology

TITLE: "A Rapid Determination of Monomer Reactivity Ratios--An Application of Gas Chromatography in Polymer Chemistry"

SOURCE: Shanghai HUADONG FANGZHI GONGXUEYUAN XUEBAO [JOURNAL OF EAST CHINA INSTITUTE OF TEXTILE SCIENCE AND TECHNOLOGY] in Chinese No 2, 1981 pp 79-86

TEXT OF ENGLISH ABSTRACT: It is with the help of gas chromatography that monomer reactivity ratios for the heterogeneous aqueous copolymerization of acrylonitrile (M_1) with methyl acrylate (M_2) at 70°C has been determined. The values of r_1 and r_2 were found to be 0.60 and 1.18 respectively. With the improvement of the experimental method, the calculation has become easier, the experimental time spent on the determination of MRR shorter, while the accuracy of the results remains the same.

AUTHOR: LIANG Borun [2733 0130 3387]
GUAN Guihe [7070 2710 5440]
et al.

ORG: All of the East China Institute of Textile Science and Technology

TITLE: "A Simple Torsion Brain Apparatus for Measuring Dynamic Mechanical Properties of Polymeric Materials"

SOURCE: Shanghai HUADONG FANGZHI GONGXUEYUAN XUEBAO [JOURNAL OF EAST CHINA INSTITUTE OF TEXTILE SCIENCE AND TECHNOLOGY] in Chinese No 2, 1981 pp 87-93

TEXT OF ENGLISH ABSTRACT: A simple torsion braid with self-recording system designed for measuring dynamic mechanical properties of polymeric materials (particularly for measuring those of fibers) is described in detail. The apparatus can work well in the temperature range of -180°C to 500°C, and the upper limit of its frequency range is 4 cps.

Results obtained with PAN fiber and PET fiber are given as illustrative examples.

AUTHOR: HUANG Jiong [7806 3518]
LIU Liangxi [0491 0081 0823]
et al.

ORG: All of the East China Institute of Textile Science and Technology

TITLE: "Application of Static Inverter Control to High-speed Spinning Machine and Analysis of the Process of Current Commutation"

SOURCE: Shanghai HUADONG FANGZHI GONGXUEYUAN XUEBAO [JOURNAL OF EAST CHINA INSTITUTE OF TEXTILE SCIENCE AND TECHNOLOGY] in Chinese No 2, 1981 pp 94-106

TEXT OF ENGLISH ABSTRACT: An approach is made for ways to meet the demands of high-speed spinning by providing static inverters with high accuracy and steady and reliable operation, and a control system that can keep the fiber tension at a constant value.

In order to satisfy the needs of developing high-speed spinning, China-made thyristers are recommended for use in low-cost, large-capacity inverters which are simple in circuit layout, stable in operation and powerful in commutation.

AUTHOR: QIAN Baojun [6929 1405 6874]
YANG Pingyu [2799 1456 3768]
et al.

ORG: All of the East China Institute of Textile Science and Technology

TITLE: "Texture of Acrylic Fibers as Evidenced by Different Approaches"

SOURCE: Shanghai HUADONG FANGZHI GONGXUEYUAN XUEBAO [JOURNAL OF EAST CHINA INSTITUTE OF TEXTILE SCIENCE AND TECHNOLOGY] in Chinese No 3, 1981 pp 1-12

TEXT OF ENGLISH ABSTRACT: Based on our work during the past several years, a synoptic view concerning the texture of acrylic fibers is attained. As evidenced by results from thermomechanical analysis, stress-strain relationship of swollen fibers, loss tangent, DSC results and half breadth of X-ray peak, the texture of acrylic fiber can be represented by a single phase model consisting of a continuous amorphous matrix with paracrystalline regions distributed as islands in the matrix. There are clues pointing to the existence of tensioned macromolecular segments which can be removed by heat treatment. Short folds may also be present, due to relaxed steam treatment. Hot stretching will cause the appearance of imperfections in the paracrystalline regions, while, on the contrary, steam heat setting in the relaxed state has the reverse effect.

AUTHOR: ZHOU Hong [0719 9464]
CHEN Shuilin [7115 3055 2651]
YANG Wenlin [2799 2429 3829]

ORG: All of the East China Institute of Textile Science and Technology

TITLE: "Effects of Side Chain of Vinyl Ester on Stereoregularity of Polyvinyl Alcohol"

SOURCE: Shanghai HUADONG FANGZHI GONGXUEYUAN XUEBAO [JOURNAL OF EAST CHINA INSTITUTE OF TEXTILE SCIENCE AND TECHNOLOGY] in Chinese No 3, 1981 pp 13-18

TEXT OF ENGLISH ABSTRACT: A series of vinyl esters have been polymerized using free radical initial system. The polymer thus prepared is used to obtain polyvinyl alcohol by alcohol hydrolysis. The effects of side chain of vinyl ester on stereoregularity of polyvinyl alcohol are investigated, and regularity of polyvinyl-sterate is also discussed.

AUTHOR: WEN Zhifu [5113 2535 4395]

ORG: East China Institute of Textile Science and Technology

TITLE: "On the Involute, Internally Engaged, Double-enveloping Worm Gear Drive. Report I: Tooth Profile"

SOURCE: Shanghai HUADONG FANGZHI GONGXUEYUAN XUEBAO [JOURNAL OF EAST CHINA INSTITUTE OF TEXTILE SCIENCE AND TECHNOLOGY] in Chinese No 3, 1981 pp 19-28

TEXT OF ENGLISH ABSTRACT: This paper is the first report on theoretical research of the involute, internally engaged, double-enveloping worm gear drive. It gives a theoretical presentation of the application of this kind of worm gear.

Here are some of its characteristics:
1. The tooth profile curve on the axial sections of the worm is an involute.
2. This worm gear is roughly the same in engagement as the internal gear.
3. Both members throat and wrap around each other.
4. The hob used to cut the wormwheel is the same as that used to cut involute gears.

This worm gear does not require very accurate mounting. It can have a greater load capability and higher efficiency.

[Continuation of HUADONG FANGZHI GONGXUEYUAN XUEBAO No 3, 1981 pp 19-28]

This paper includes: (1) the equation for worm tooth surface of the involute, internally engaged, double-enveloping worm gear drive; (2) peculiar phenomenon of double-enveloping worm gears with the same turn ratio ("low-lying land"); (3) line of action in the central section (straight line); (4) a theoretical basis of the hobbing process and other advantages.

AUTHOR: FANG Xiaochu [2455 2556 0443]

ORG: East China Institute of Textile Science and Technology

TITLE: "On the Involute, Internally Engaged, Double-enveloping Worm Gear Drive. Report II: Relative Curvature Cutting and Testing"

SOURCE: Shanghai HUADONG FANGZHI GONGXUEYUAN XUEBAO [JOURNAL OF EAST CHINA INSTITUTE OF TEXTILE SCIENCE AND TECHNOLOGY] in Chinese No 3, 1981 pp 29-39

TEXT OF ENGLISH ABSTRACT: Quantitative analyses are made of this worm gear and the results of its development are presented.

Contact lines between worm and worm gear and relative curvature are the main factors influencing the properties of worm gear drive. To illustrate, a figure of contact lines is shown and the values of relative curvatures, etc., are listed, where center distance $A_0 = 150$, module $m = 6$, ratio of revolution $i_{12} = 41$. These values were obtained with the help of a digital computer. For comparison, the authors have also listed the corresponding values of Archimedes' and Hindley worm gear with the same parameters. It can be seen that the values of the involute, internally engaged, double-enveloping worm gear drive are far better than those of Archimedes'. Its drive behavior is thought to be better than that of the Hindley worm gear.

This paper gives a brief description of the manufacturing method of this worm and worn gear. Essentially, this worm gear was hobbed with the ordinary hob for involute

[Continuation of HUADONG FANGZHI GONGXUEYUAN XUEBAO No 3, 1981 pp 29-39]

gears. The hobbing process consists of four steps. The approximate degree of the tooth surface of this worm gear is good; the duration of transforming approximate surface into conjugate surface is short; and the sensibility to the deviation in working and assembling of this worm gear drive is not remarkable. The absence of necessity to process the complicated Hindley hob will make it easier for this worm to be popularized.

The efficiency of this worm gear drive is found to be up to 0.717 at a rotational speed of 1610 rpm. When compared with Archimedes' worm, its performance has proved much better both in load-carrying capacity and in drive efficiency.

AUTHOR: RONG Guangyi [2837 1639 7328]

ORG: East China Institute of Textile Science and Technology

TITLE: "Fuzzy Information Retrieval System"

SOURCE: Shanghai HUADONG FANGZHI GONGXUEYUAN XUEBAO [JOURNAL OF EAST CHINA INSTITUTE OF TEXTILE SCIENCE AND TECHNOLOGY] in Chinese No 3, 1981 pp 40-48

TEXT OF ENGLISH ABSTRACT: In this paper an automatic information retrieval and organization system is described. A reader has only to send in one to six keywords to define the scope of literature he wants to study, and the machine will search among its collections (i.e., the data base) to pick out the literature required. The system is realized on a microcomputer (CROMEMCO System 2) with 64k bytes RAM and two 5 inch disk drives. The programming language used is the 16k extended BASIC of CROMEMCO because BASIC is the most popular high-level language on the mini- and microcomputers in China. The system is characterized by its three special features:
1. The fuzzy subset is employed as the mathematical model for classifying the literature in the data base. This method is especially effective in treating that literature that is related to several different specialties.
2. The scatter storage structures are used to organize the keyword list so that the time required to search for a keyword will not increase in proportion to the contents of the data base.

[Continuation of HUADONG FANGZHI GONGXUEYUAN XUEBAO No 3, 1981 pp 40-48]

3. The whole system should be compatible with the limited memory size of the microcomputer.

Discussion Under the present conditions of our machine, the data base may contain up to 5000 documents. The system is tested with a model data base of 162 records. The time required to wait for the response of the retrieval system for different sets of inquiry keywords is recorded. The maximum period is 98 sec, while the minimum is 23 sec. Most of the waiting time is spent on disk I/O. It is expected that if the system is extended with a hard disk drive, the waiting time will be diminished 10 times and the data base may be greatly expanded. It is further suggested that the system may be modified by employing the fuzzy clustering technique to speed up the information retrieval process if the data base is expanded to a considerably larger size.

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TITLE: "An Approach to Technology and Mechanism of Heat Setting of Fabrics Containing Terylene (I)"

SOURCE: Shanghai HUADONG FANGZHI GONGXUEYUAN XUEBAO [JOURNAL OF EAST CHINA INSTITUTE OF TEXTILE SCIENCE AND TECHNOLOGY] in Chinese No 3, 1981 pp 49-60

TEXT OF ENGLISH ABSTRACT: The mechanism and technical improvement of heat setting of terylene filament and T/C blended fabrics have been investigated. In these experiments, nine different modern and ordinary instruments and methods, such as X-ray diffractor, IR spectroscopy, differential thermal analysis, were used to estimate the changes in terylene's supermolecular structure and fabric quality after heat setting such dimension thermal stability, crease recovery, etc. [sic] Critical Dissolution Time (CDT) of terylene filament in phenol was used to examine the degree of heat setting. The method of estimating the CDT value of terylene staple filter in T/C blends has been established. Good correlations between

[Continuation of HUADONG FANGXUE GONGXUEYUAN XUEBAO No 3, 1981 pp 49-60]

crystallinity (d_c), crystal size (Δ), CDT value, dry thermal shrinkage (C) and heat setting temperature (T) are found. There is an inflexion at 194°C and 196°C in the crystal size vs heat setting temperature and CDT value vs heat setting temperature curves respectively. The relations between crystallinity, 1 g crystal size, 1 g dry thermal shrinkage and 1 g CDT may be shown as follows:

$1 \text{ g CDT} = 10.34 \times 10^{-3}T - 13.33 \times 10^{-3}$

$1 \text{ g CDT} = 59.08 \times 10^{-3} d_c - 1.34$

$1 \text{ g S} = 0.439/1 \text{ g CDT} + 0.8803$

$1 \text{ g C} = 2.5899 - 1.1855 \; 1 \text{ g CDT}$ (constant length, warp)

$1 \text{ g C} = 3.202 - 1.882 \; 1 \text{ g CDT}$ (slack, warp)

The energy of activation and the frequency of collisions for supermolecular structure changes of terylene are 1.806×10^4 cal and $5.355 \times 10^8 \text{ sec}^{-1}$ respectively. According to the facts shown above, the CDT value of terylene can be used as a criterion for assessing the crystallinity, crystal size or crystal perfection of terylene fiber, hence a simple and effective method for assessing the result of heat setting.

For improving the dimension thermal stability of terylene containing fabrics, the temperature of the setting should be near or slightly lower than the highest temperature of the thermal history of the fabric or 20-30°C higher than the temperature to be encountered in its use. As T/C blended fabrics have better dimension thermal stability, the temperature used for setting may be lower than that used for terylene filament fabrics.

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No decrease of amorphous orientation has been found during setting except at temperatures beyond 220°C. The dyeing property of set terylene fabrics depends on the crystallinity and porosity of the fiber. The effects of tension and setting time are also discussed.

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TITLE: "Preliminary Research on the Regularities of Distribution of a Particular Point on the Curve of Intersection of a Right Circular Cone and a Right Circular Cylinder with Their Axes Obliquely Intersecting and the Method of Locating the Particular Point"

SOURCE: Shanghai HUADONG FANGZHI GONGXUEYUAN XUEBAO [JOURNAL OF EAST CHINA INSTITUTE OF TEXTILE SCIENCE AND TECHNOLOGY] in Chinese No 3, 1981 pp 61-70

TEXT OF ENGLISH ABSTRACT: By using the method of mathematical analysis, this article deals with the particular point A, the point with minimum X-coordinate in the front view, the curve of intersection of a right circular cone and a right circular cylinder with their axes obliquely intersecting. In this article the particular points are solved both theoretically and graphically in a comparatively satisfactory manner.

Through preliminary research, two regularities have been derived as follows:

1. These particular points are distributed on a plane (its front view being an edge view), represented by the following line equation

$$\frac{\sin^2\alpha + \sin^2\theta\cos^2\alpha}{h\sin^2\alpha}z - \frac{\cos^2\alpha\sin\theta\cos\theta}{h\sin^2\alpha}x = 1$$

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2. The said particular points are also distributed on the surface of an ellipsoid, whose major axis is the same as the axis of the right circular cylinders. The front view of the ellipsoid is an ellipse represented by the following equation

$$\frac{1 - \cos^2\theta\cos^2\alpha}{h^2\sin^2\alpha}x^2 + \frac{1}{h^2\sin^2\alpha}z^2 = 1$$

The particular point may be easily located by only drawing straight lines and circles.

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TITLE: "The Piezo-electric Fork for Remote Supervisory Control Equipment"

SOURCE: Shanghai HUADONG FANGZHI GONGXUEYUAN XUEBAO [JOURNAL OF EAST CHINA INSTITUTE OF TEXTILE SCIENCE AND TECHNOLOGY] in Chinese No 3, 1981 pp 71-80

TEXT OF ENGLISH ABSTRACT: The characteristics of the piezo-electric fork filter and oscillator are discussed, and the technology for its manufacture is described. A variety of fork design curve is suggested for designers.

The performance data obtained are as follows:
1. The temperature frequency stability coefficient is $-8 \times 10^{-6}/°C$.
2. The 3 (db) frequency bandwidth is 2 c/s.

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TITLE: "The Force Exerted on the Verge During the Formation of the Knitted Loop"

SOURCE: Shanghai HUADONG FANGZHI GONGXUEYUAN XUEBAO [JOURNAL OF EAST CHINA INSTITUTE OF TEXTILE SCIENCE AND TECHNOLOGY] in Chinese No 3, 1981 pp 81-90

TEXT OF ENGLISH ABSTRACT: The relationship between the dynamic force exerted on the verge and the yarn tension in the loop-forming-cycle is described in this paper. A specially-designed verge transducer is used to detect the force exerted on it in the authors' experiments for investigation of the yarn tension during the formation of the knitted loop. Some effects of different settings of the verge transducer on the oscillogram of the force exerted on it are discussed. As the result of extensive experimental research, a typical model of an oscillogram of the force exerted on the verge is presented and useful conclusions are drawn, such as that of the yarn tension during the cast-off or stitch-draw stage.

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TITLE: "A Study of the Carding Action of Jute Roller Card"

SOURCE: Shanghai HUADONG FANGZHI GONGXUEYUAN XUEBAO [JOURNAL OF EAST CHINA INSTITUTE OF TEXTILE SCIENCE AND TECHNOLOGY] in Chinese No 3, 1981 pp 91-99

TEXT OF ENGLISH ABSTRACT: Based on the theory of the Markovian Process, the performance of the jute breaker card and finisher card is discussed. The average number of cardings and average duration of roller carding of the fiber have been presented. Analysis and calculations are made in the extensive experiment, and methods are suggested for improving the carding, evening and mixing.

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ORG: All of the East China Institute of Textile Science and Technology

TITLE: "A Study of Rheological Properties of Molten Polyethylene Terephthalate. Part I: Influence of Moisture Content on Melt Rheological Properties at Low Shear Rates"

SOURCE: Shanghai HUADONG FANGZHI GONGXUEYUAN XUEBAO [JOURNAL OF EAST CHINA INSTITUTE OF TEXTILE SCIENCE AND TECHNOLOGY] in Chinese No 3, 1981 pp 101-106

TEXT OF ENGLISH ABSTRACT: This paper deals with the influence of the moisture content in polyester chips on melt rheological properties at the melt temperature (284°C) and low shear rates ($<10^3$ sec^{-1}). The following results have been obtained:
1. When the moisture content in polyester chips is in the range of 0.015 - 0.025 percent, the melt viscosity decreases by about 1.3 percent while increasing the moisture content by every 0.001 percent.
2. Under the conditions of this esperiment, the polyester melt is a pseudoplastic fluid and has the flow properties of shear thinning.

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TITLE: "Studies on Low Temperature Solution Condensation Polymerization of P-Phenylenediamine and Terephthaloyl Chloride in N-Methyl-2-Pyrrolidone and Calcium Chloride"

SOURCE: Shanghai HUADONG FANGZHI GONGXUEYUAN XUEBAO [JOURNAL OF EAST CHINA INSTITUTE OF TEXTILE SCIENCE AND TECHNOLOGY] in Chinese No 3, 1981 pp 107-116

TEXT OF ENGLISH ABSTRACT: A process is described for producing high molecular weight poly (paraphenylene terephalamide) from paraphenylene diamine and terephthaloyl chloride, using the solvent system of N-methyl-2-pyrrolidone and calcium chloride. Systematic investigation has been made of the monomers' molar ratio, monomer purity, water of the reaction system, content of calcium chloride, polymerization temperature, polymerization time, monomer concentration, the additive used and agitating or kneading on molecular weight of the polymer. The resultant polymer can be used for the spinning of a high-tenacity and high-modulus fiber.

AUTHOR: HOU Huaide [0186 2037 1795]

ORG: East China Institute of Textile Science and Technology

TITLE: "Draft Plans for Weaving Warp Pile Fabrics by Double-layer Double-shed Warp Mounting"

SOURCE: Shanghai HUADONG FANGZHI GONGXUEYUAN XUEBAO [JOURNAL OF EAST CHINA INSTITUTE OF TEXTILE SCIENCE AND TECHNOLOGY] in Chinese No 3, 1981 pp 117-124

TEXT OF ENGLISH ABSTRACT: In this paper particular features of draft plans for weaving velveteens on the double-nozzle jet loom and for warp pile fabrics by double-shed warp mounting have been discussed. Also suggested is a more rational method of making draft plans for weaving warp pile fabrics with double-layer double-shed mounting. In addition, the author points out some common defects in making draft plans for these types of fabrics in current textbooks and other literature.

AUTHOR: TANG Tongye [3282 2717 2814]
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TITLE: "Noise Transmitted from Gear Box and Its Reduction"

SOURCE: Shanghai HUADONG FANGZHI GONGXUEYUAN XUEBAO [JOURNAL OF EAST CHINA INSTITUTE OF TEXTILE SCIENCE AND TECHNOLOGY] in Chinese No 3, 1981 pp 125-133

TEXT OF ENGLISH ABSTRACT: Based on their study and practice of gear box noise in recent years, as well as domestic and foreign literature, the authors have summarized factors influencing the mechanical transmission noise, with emphasis placed on the causes of noise in gear meshing and its general laws. Transmission and radiation of noise from the gear box have been analyzed, and methods, effective in practice, for detecting the main noise source are presented briefly. Finally, measures for designs and techniques of controlling gear box noise have been proposed in detail and examples for reducing noise in shop practice are illustrated.

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TITLE: "A New Opener for Silk Spinning"

SOURCE: Shanghai HUADONG FANGZHI GONGXUEYUAN XUEBAO [JOURNAL OF EAST CHINA INSTITUTE OF TEXTILE SCIENCE AND TECHNOLOGY] in Chinese No 3, 1981 pp 134-138

TEXT OF ENGLISH ABSTRACT: A general description of the new opener for silk spinning, including the design, structure and performance, is given in this paper.

The test results show that the opener has improved the opening and clearing effects of the material to be treated, thereby facilitating the subsequent processes. As a result, the yield has been raised and the level of automation increased. Therefore, the new opener is fit to replace the traditional cocoon opener and ready to be applied in production. It is recommended as an effective machine in the new system of silk spinning.

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TITLE: "Determination of the Approximate Characteristic Parameters for an Extensive Controlled Process"

SOURCE: Shanghai HUADONG FANGZHI GONGXUEYUAN XUEBAO [JOURNAL OF EAST CHINA INSTITUTE OF TEXTILE SCIENCE AND TECHNOLOGY] in Chinese No 3, 1981 pp 139-148

TEXT OF ENGLISH ABSTRACT: In order to determine the controller's parameters in a process control system, it is necessary that the extensive controlled process be regarded as a first-order lag component. A lot of calculating work has led to the presentation of curves showing the direct relationship of the time constant T and the dead time τ to the second-order time constants T_1 and T_2. These curves may serve to make it easy to determine the parameters T and τ according to given time constants T_1 and T_2.

Repeated use of the curves will help to determine the corresponding parameters T and τ of a high-order lag component which consists of some first-order lag components cascaded mutually.

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TITLE: "Measurement of and Meter for the Twist of OE Yarn. Part III: A Study of the OE Yarn Twist Problems"

SOURCE: Shanghai HUADONG FANGZHI GONGXUEYUAN XUEBAO [JOURNAL OF EAST CHINA INSTITUTE OF TEXTILE SCIENCE AND TECHNOLOGY] in Chinese No 3, 1981 pp 149-158

TEXT OF ENGLISH ABSTRACT: According to the characteristics of the OE yarn formation process and the twist structure, existing methods for measuring the yarn twist are analyzed. It is found that they cannot express and determine exactly the amount of actual twist inserted in OE yarn. Based on the role of twist distribution of OE yarn, a method for a single untwisting process is proposed. It can be used as a new method to measure the OE yarn twist. Also, a meter used for this method has been developed.

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TITLE: "Rapid Determination of Size Pick-up"

SOURCE: Shanghai HUADONG FANGZHI GONGXUEYUAN XUEBAO [JOURNAL OF EAST CHINA INSTITUTE OF TEXTILE SCIENCE AND TECHNOLOGY] in Chinese No 3, 1981 pp 159-162

TEXT OF ENGLISH ABSTRACT: In this paper rapid determination of size pick-up based on quantitative analysis is suggested. In various sizing agents, such as CMC, sodium alginate, caustic soda, sodium silicate, anionic surfactants, etc., there exists a common element, i.e., sodium, which does not evaporate under relatively high temperatures and the quantity of which can easily be determined by titrating the residue of burned size. Experiments have revealed that the content percentage of sodium in size liquor prepared according to a certain recipe remains constant. Determining separately the sodium contents both of size liquor and sized warp, the weight of dry size on the warp can readily be deduced, and thus the size pick-up determined. Total time required for the above-mentioned operations does not exceed one hour, while the traditional desizing method takes no less than six hours.

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TITLE: "Taper of Guiding Aperture on a Jet Loom Guiding Member"

SOURCE: Shanghai HUADONG FANGZHI GONGXUEYUAN XUEBAO [JOURNAL OF EAST CHINA INSTITUTE OF TEXTILE SCIENCE AND TECHNOLOGY] in Chinese No 3, 1981 pp 163-168

TEXT OF ENGLISH ABSTRACT: The guiding aperture of the improved guiding member has a taper form. Optimum values for the taper are discussed theoretically and practically. The results show that the wall of the guiding aperture in an angle of two degrees can reduce more diffusion loss of the air stream from the gaps of the guiding comb than other tapers can. At the same time, the friction resistance loss on the wall of the guiding aperture is hardly increased.

When the improved guiding members are applied, the speed of the air stream increases over 7 percent at the outlet of the guiding comb.

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TITLE: "Developing a Constant Temperature Hot Wire Anemometer"

SOURCE: Shanghai HUADONG FANGZHI GONGXUEYUAN XUEBAO [JOURNAL OF EAST CHINA INSTITUTE OF TEXTILE SCIENCE AND TECHNOLOGY] in Chinese No 3, 1981 pp 169-177

TEXT OF ENGLISH ABSTRACT: A new type of compact constant-temperature hot wire anemometer is introduced in this paper. It has a large air speed range (5-180 m/s), excellent frequency response and a small probe to reduce the disturbance in the measured air flow. The results of air speed are digitally displayed.

It can be used not only to measure general air flow rate conveniently, but also to satisfy the particular requirements for measuring high speed pulsating air flow on, for example, an air jet loom.

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TITLE: "An Inquiry into the Problem of the Direction of Yarn Twist Varying through Historical Ages"

SOURCE: Shanghai HUADONG FANGZHI GONGXUEYUAN XUEBAO [JOURNAL OF EAST CHINA INSTITUTE OF TEXTILE SCIENCE AND TECHNOLOGY] in Chinese No 3, 1981 pp 178-184

TEXT OF ENGLISH ABSTRACT: Some foreign scholars have suggested that the twist direction of yarns in ancient China were essentially of the "S"-twist type until the Song dynasty, and then the main twist direction was reversed. In this paper this problem is discussed based on an extensive study of the historical development of spinning instruments as well as an investigation of specimens of ancient fabrics demonstrated in some museums. No evidence has been found to support the mentioned suggestion.

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TITLE: "The Occurrence and Development of the Multispindle Spinning Frame in Ancient China"

SOURCE: Shanghai HUADONG FANGZHI GONGXUEYUAN XUEBAO [JOURNAL OF EAST CHINA INSTITUTE OF TEXTILE SCIENCE AND TECHNOLOGY] in Chinese No 3, 1981 pp 185-192

TEXT OF ENGLISH ABSTRACT: The multispindle spinning frame (MSF) made its first appearance in the Song dynasty. It was in fact a twisting frame for silk and ramie filaments. The twisting instruments in ancient China were of several kinds which succeeded one another: single spindle, hand-pushing spinning wheel, foot spinning wheel and twisting frame, etc. Of all the twisting instruments, the MSF had the highest productivity. The MSF had 32 spindles, and was especially fit for processing warp and weft yarns with strong or weak twists, giving yarns good evenness and high quality for superior fabrics, e.g., crepe, damask and brocade, etc.

The MSF was derived from other twisting instruments formerly in use, and is still being used in some villages. The working principles of the MSF are quite different. That is the reason why it was created originally. The invention of the MSF was an important contribution to the development of hand twisting technology in ancient China.

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